Beach Lake Mitigation Bank Restoration Plan

(March 1993, Revisions March 1996 and February 1998)

03-SAC-05-12.7

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1.0 INTRODUCTION

1.1 PROJECT LOCATION

The Beach Lake Mitigation Bank (BLMB) is located in Sacramento County, California, approximately 1.6 km (1 mile) south of the town of Freeport, immediately south of Morrison Creek, west of Interstate 5, and about 0.8 km (0.5 mile) east of the Sacramento River (Figure 1). The project is located on the U.S. Geological Survey Florin 7.5' quadrangle in Township 7 North, Range 4 East, Sections 24 and 25 (38°26'00"N, 121°29'30"W) within the northern portion of the Stone Lakes National Wildlife Refuge. The Refuge is about 16 km (10 miles) south of Sacramento.

1.2 PROJECT BACKGROUND

In the mid 1970's, the California Department of Transportation (Caltrans) purchased the three properties included in this project to provide right of way for construction of Interstate 5. In total, these properties include 57.5 ha (142 acres) which were not needed for highway purposes.

During 1990-91 Caltrans began negotiations with the U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Game (CDFG), U.S. Army Corps of Engineers (ACOE), U.S. Environmental Protection Agency (EPA), and the Federal Highways Administration on the terms of an agreement whereby this property could be used for compensation of unavoidable impacts to wetlands and other valuable biological habitats. Also in that time period, Caltrans began site investigations to assess existing resource values, physical factors, and issues relevant to restoration of the property. Information collected to date is discussed in the latter portions of this document.

The separate formal Agreement on Mitigation Strategy (Appendix 10.1) adopted for this project specifies criteria for use of the BLMB, performance requirements, and accounting procedures. A separate monitoring plan was developed for this project during September 1996.

1.3 REGIONAL RESTORATION ACTIVITIES

Several other proposals to restore natural habitats have a bearing on this project. The USFWS has established the Stone Lakes National Wildlife Refuge which encompasses the Caltrans parcel. Figure 2 indicates the Wildlife Refuge core area boundaries and locations of several other projects and landmarks. An approximately 162 ha (400 acre) parcel (Lewis parcel) contiguous with the southern boundary of the BLMB and owned by the USFWS is undergoing restoration of wildlife habitats. Also to the south of the BLMB, a parcel approximately 405 ha (1,000 acres) owned by the County of Sacramento immediately south of the Lewis parcel is being restored and preserved for wildlife uses. To the north of the BLMB, the County of Sacramento recently acquired (1995)

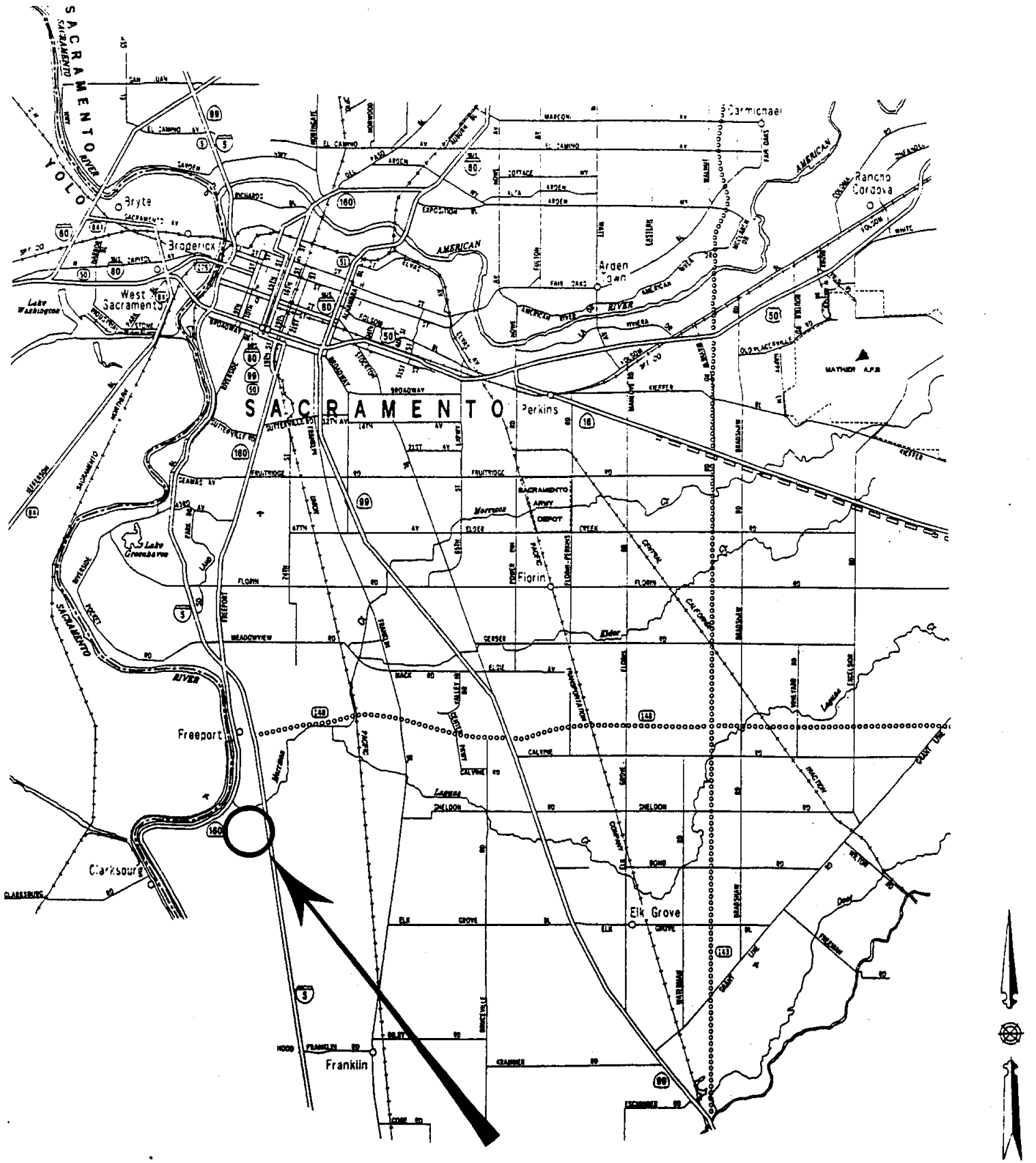


Figure 1. Location Map for the Beach Lake Mitigation Bank, Sacramento, CA.

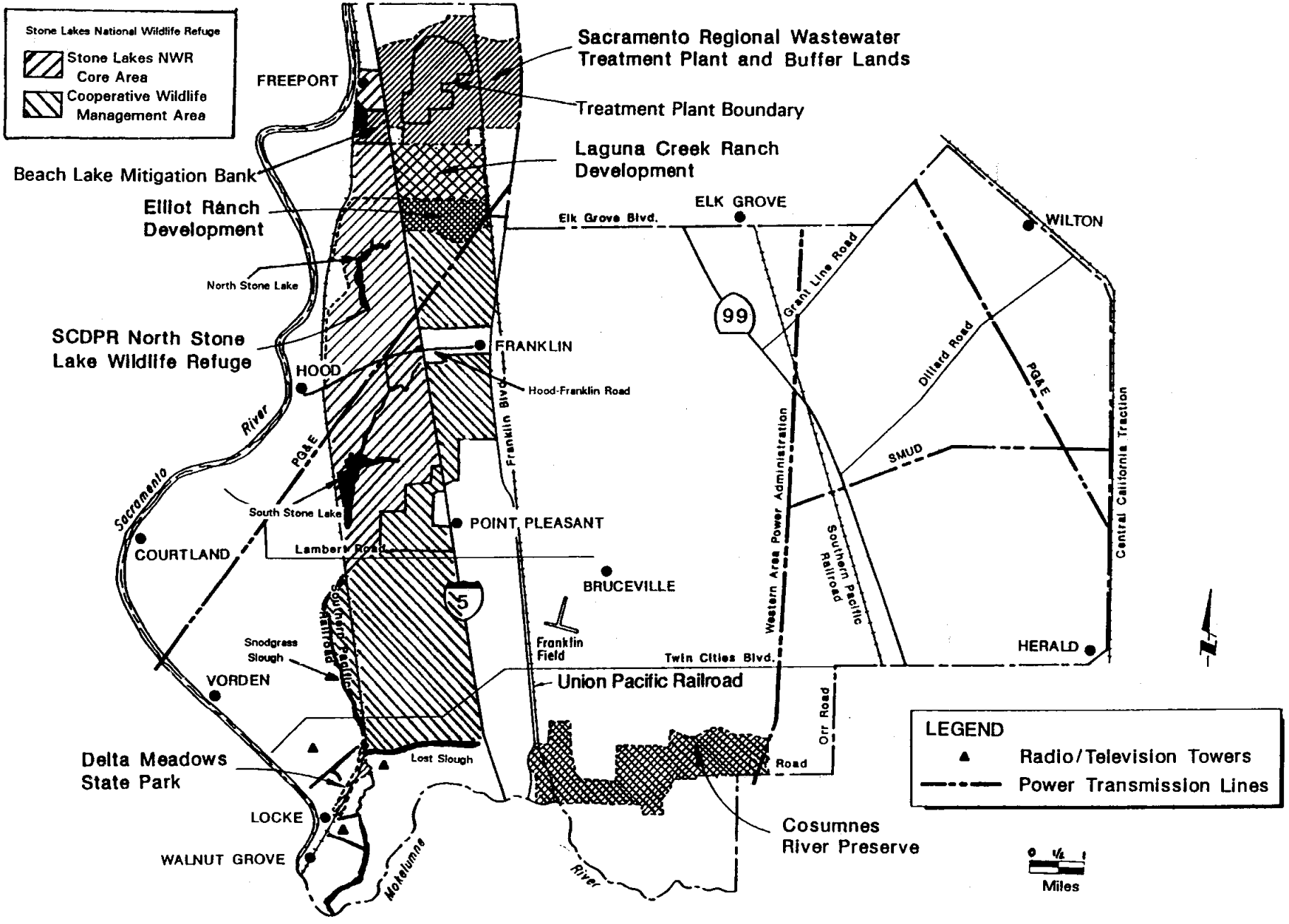


Figure 2. Stone Lakes National Wildlife Refuge Map, Sacramento Co.

a 80.9 ha (200 acre) parcel to be restored to wildlife habitats. On the east side of Interstate 5, the County of Sacramento is also restoring approximately 222.5 ha (550 acres) along Morrison and Laguna Creeks at the Sacramento Regional Wastewater Treatment Plant Buffer Lands. Habitat types proposed in these areas include native and annual grasslands, seasonal and permanent marsh, and riparian and oak woodlands. A total of 871 ha (2,150 acres) of wildlife habitat is being restored or preserved on the parcels surrounding the BLMB.

Approximately 19 km (12 miles) southeast of this area are lands owned by Ducks Unlimited, The Nature Conservancy, Bureau of Land Management, County of Sacramento, California Department of Water Resources, and CDFG near the Cosumnes River (Cosumnes River Preserve). Lands currently owned or managed through easements by these organizations total approximately 2,226 ha (5,500 acres). Habitat restoration work to include several wetland and upland plant communities is in progress.

The proximity of these other restoration efforts increases the likelihood that habitat values for wildlife at the BLMB can be quite high. The geographic location of the BLMB adjacent to Morrison Creek and Beach Lake will also enhance habitat values on site.

1.4 PURPOSE OF THIS PLAN

The purpose of this restoration plan is to describe existing conditions, identify important planning issues, and provide the project design of the BLMB. Sufficient information has been collected to describe 1) the physical and biological factors that affected project design, 2) types of habitat appropriate for restoration and where they are located, 3) methods for accomplishing the restoration, and 4) information needs which remain.

The term "restoration" is used throughout this document to describe the conversion of lands currently being farmed or fallow lands to habitats intended to resemble historic natural plant communities. All of the proposed habitats were or are present within the Beach/Stone Lakes Basin but may not have been located precisely where they are proposed for this project. For parts of this project the term "creation" may be more appropriate. However, this distinction has little practical significance and "restoration" is used preferentially here. A third term, "enhancement", includes actions intended to improve plant diversity or wildlife values of existing habitats but leave the community substantially "as is".

This project is intended to develop wetland habitats which will offset future impacts of highway projects in the lower Sacramento and upper San Joaquin valleys. The approach followed in the BLMB has several key advantages over typical mitigation efforts which are attempted on a case by case approach for individual projects. These benefits include:

- Establishment of mitigation habitats before project impacts occur. The quality of mitigation efforts will be known.

- Habitat values in general will be improved because other restored and naturally occurring habitats are in close proximity, increasing the functional size of this particular ecological system.
- Habitat values will be improved through the inclusion of buffers and specific design features which are frequently not feasible for small, isolated mitigation efforts.
- Maintenance and monitoring efforts will be facilitated by the relatively large habitat acreages created within a single location during a single period of time.
- Long-term ownership and management within the context of a larger national wildlife refuge reduces the possibility of later destruction or modification.

2.0 ENVIRONMENTAL SETTING

2.1 LAND USE

The property had been farmed from the mid-1970's until 1990 under a lease agreement and since 1991 has not been used for agricultural purposes. A subsurface irrigation pipe traverses an east-west alignment through the southerly third of the project but is not functional and will be removed as part of the construction of the wetlands. Site conditions (i.e. hardpan, clay soils, flood risk, poor access, lack of a functional irrigation system) generally limit the agricultural potential of the site. Typical crops previously planted included safflower, corn, and occasionally sugar beets. The property was planted to safflower in 1990 and was fallow in subsequent years.

This property and most others in the area have been farmed since the early years of the twentieth century. Recent changes in this pattern include the construction of Interstate 5 in the 1970's, establishment of the Sacramento Regional Wastewater Treatment Plant and Buffer Lands east of Interstate 5 during the same time period, purchase of lands near North Stone Lake in the late 1970's by the Sacramento County Department of Parks and Recreation, current construction of residential and commercial developments east of Interstate 5, and the establishment of the Stone Lakes National Wildlife Refuge in 1992. While agriculture is likely to persist between the railroad tracks and Sacramento River, most lands in the vicinity of the BLMB are proposed for either development or habitat restoration.

2.2 HYDROLOGY

Hydrology of the project area is substantially altered from the historic conditions. The extent and status of these alterations is of considerable interest in developing a restoration plan. For comparative purposes the following discussions of historic (circa 1850) and current conditions are presented.

2.2.1 Historic Hydrology

The Sacramento River is the pivotal hydrologic feature in the landscape of Sacramento County. Repeated overbank flooding formed natural levees along the active river channel with low lying basins both east and west of the river. The Beach/Stone Lakes Basin was flooded for long periods of time in the winter and spring. Overbank flooding from the Sacramento River and backwater flooding from the Cosumnes and Mokelumne Rivers were the primary sources although Morrison and Laguna Creeks also played an important role. As spring runoff through the Sacramento-San Joaquin Delta declined, water drained from the Beach/Stone Lakes basin.

The Morrison Basin is comprised of Morrison, Laguna, Elder, and Unionhouse Creeks and is approximately 180 square miles in size. Historic maps indicate that Beach and Stone Lakes were connected by Morrison Creek but probably had no hydrologic connection with the Delta or each other in summer and fall. Since the watersheds for Laguna and Morrison Creeks are entirely within Sacramento County, and receive no runoff from the Sierra Nevada mountains, it is unlikely that they flowed during the summer or fall. Summer water levels in Beach and Stone Lakes were maintained by high groundwater levels fed by the Sacramento River. In addition to the permanent marshes of Beach and Stone Lakes, there were extensive seasonal wetlands, mostly on Clear Lake and Egbert soils, which were wet or saturated until about late April or May.

Historic groundwater levels were quite high in this area. San Joaquin and Dierssen soils had perched water tables through the spring months. Apparent spring groundwater levels in other soils were less than 3 m (10 feet) below the surface (California Department of Water Resources, 1978).

2.2.2 Modern Hydrology

Significant alterations which have a bearing on current and future hydrology include:

- Construction of flood control levees and dams on the Sacramento, American, Cosumnes, and Mokelumne Rivers.
- Operation of water control structures on the Lambert Road bridge over Snodgrass Slough.
- Excavation of the canal (hereafter referred to in this Restoration Plan as Stone Lake Slough but also known as "Stone Lake Drain" and the "S.P. Cut" in other documents) to provide material for the Southern Pacific Railroad embankment.
- Increasing depth to groundwater as a result of pumping for agricultural and domestic uses.
- Construction of the Beach Lake Dike dividing historic Beach Lake into Upper and Lower Beach Lakes (Beach Lake).
- Pumping of water from Upper Beach Lake and Morrison Creek into the Sacramento River (Pump Station 90).
- Numerous agricultural pumping diversions from Snodgrass and Stone Lake Sloughs.
- Construction of numerous levees and fills in the Beach/Stone Lakes Basin to provide flood

protection either by excluding flood waters or raising development above projected flood elevations.

- Urbanization of the Laguna and Morrison Creek watersheds which creates and augments summer streamflow, recharges groundwater, and changes the characteristics of flood runoff.
- Establishment of water hyacinth (*Eichhornia crassipes*) in Stone Lake Slough, Snodgrass Slough, and lower Beach Lake resulting in increased siltation, reduced or impaired pumping efficiency, and reduction of surface flows.

Current maps of surface hydrology show Laguna Creek as a tributary to Morrison Creek upstream of Interstate 5. Morrison Creek flows under Interstate 5 to the Beach Lake Dike and is diverted westerly in a canal and pumped through the Sacramento River levee into the river. Water surface elevations in Morrison Creek are maintained at -0.52 to -1.13 m (-1.7 to -3.7 feet) mean sea level (MSL) by pumping to facilitate farming and maintain flood storage capacity in former Upper Beach Lake. Beach Lake, southwest of the Beach Lake Dike, is connected to Stone Lake Slough in several locations where a former agricultural levee had failed. The substrate of Beach Lake has little topographic relief thereby resulting in a relatively uniform water depth of about 1.2 m (4 feet).

Stone Lake Slough is oriented north-south along the railroad tracks and connects during high water periods with North and South Stone Lakes. Snodgrass Slough connects to South Stone Lake and provides a surface hydrologic connection for the Beach/Stone Lakes Basin to the Sacramento-San Joaquin Delta near the town of Locke. An important node in this network is the Lambert Road Bridge. A series of culverts with flap gates under this structure were originally constructed to successively lower water surface elevations in the Beach/Stone Lakes Basin during ebb tides. These gates had deteriorated and did not efficiently function in the originally intended manner. The bridge structure and associated water control structures were replaced with a modern concrete structure in late 1995.

Summer water surface elevations in Stone Lake Slough and Beach Lake fluctuated in 1991 within a range of about 0.67 to 0.79 m (2.2 to 2.6 feet) MSL. Conventional explanations for this include tidal fluctuations but our review of tidal cycles and water levels do not show any correlation. Agricultural activities in diverting or returning water to Stone Lake Slough are probably more important. The County of Sacramento operates a recording stream gauge on Stone Lake Slough. Data from this gauge indicates that summer water levels in the slough have risen from a modal value of about 0.55 m (1.8 feet) MSL in 1988 to current levels of about 0.76 m (2.5 feet) MSL. Since there is no clear explanation for this change it is impossible to predict possible future fluctuations.

Flooding is an important planning consideration in the design of the BLMB. Predictions of future flood elevations vary with assumptions about degree of urbanization, design and operation of a replacement structure at Lambert Road, and pumping capacity of Pump Station 90 at the terminus of Morrison Creek. A recent study (Gill and Pulver Engineers, 1988) predicts water

surface elevations at Stone Lake, under existing conditions, for flood events as follows:

RECURRENCE INTERVAL	ELEVATION
0.5 years	1.43 m (4.7 feet) MSL
2.0 years	1.80 m (5.9 feet) MSL
5.0 years	2.26 m (7.4 feet) MSL

Current groundwater levels are generally lower than historic conditions. Perched water on Dierssen soils is generally present for shorter periods of time due to flood protection, leveling, and drainage. Apparent water tables have been lowered partially for the same reasons, but also because of groundwater pumping for agricultural, domestic, and municipal uses. At the BLMB, groundwater levels measured during summer 1991 ranged from 1.13 to 4.57 m (3.7 to 15 feet) below the soil surface.

2.3 SOILS

The Sacramento County Area Soil Survey (U.S. Department of Agriculture Soil Conservation Service, 1993)(SCS) shows five soil types present on the BLMB property (Figure 3). Site investigations performed by consulting soil scientists and Caltrans staff were used along with published information to develop the following discussions relating to each type. Figure 3 is modified from the Sacramento County Area Soil Survey mapping by field investigations performed in April 1991. Additional on-site investigations in May 1992 indicate that hardpan, which is associated with the Dierrsen mapping unit, is less extensive than shown by the Dierrsen Sandy Clay Loam unit (135) in Figure 3.

2.3.1 Clear Lake Clay - (SCS mapping unit #114)

This type is present near Morrison Creek and in the southeast corner of the site where it is associated with the unnamed drainage along the southern boundary. This is a deep, poorly drained soil with slow permeability and high shrink-swell potential. Formed within the upper portions of the floodplain or along low gradient stream channels, these soils were historically wet for long periods and probably supported either permanent or seasonal freshwater marsh vegetation. Soils in this mapping unit lack a duripan.

2.3.2 Clear Lake Clay (hardpan) - (SCS mapping unit #115)

Surface horizons are similar to the above mapping unit, however, this variant is distinguished by the presence of a cemented duripan at 1.02 to 1.52 m (40 to 60 inches). The duripan formed as

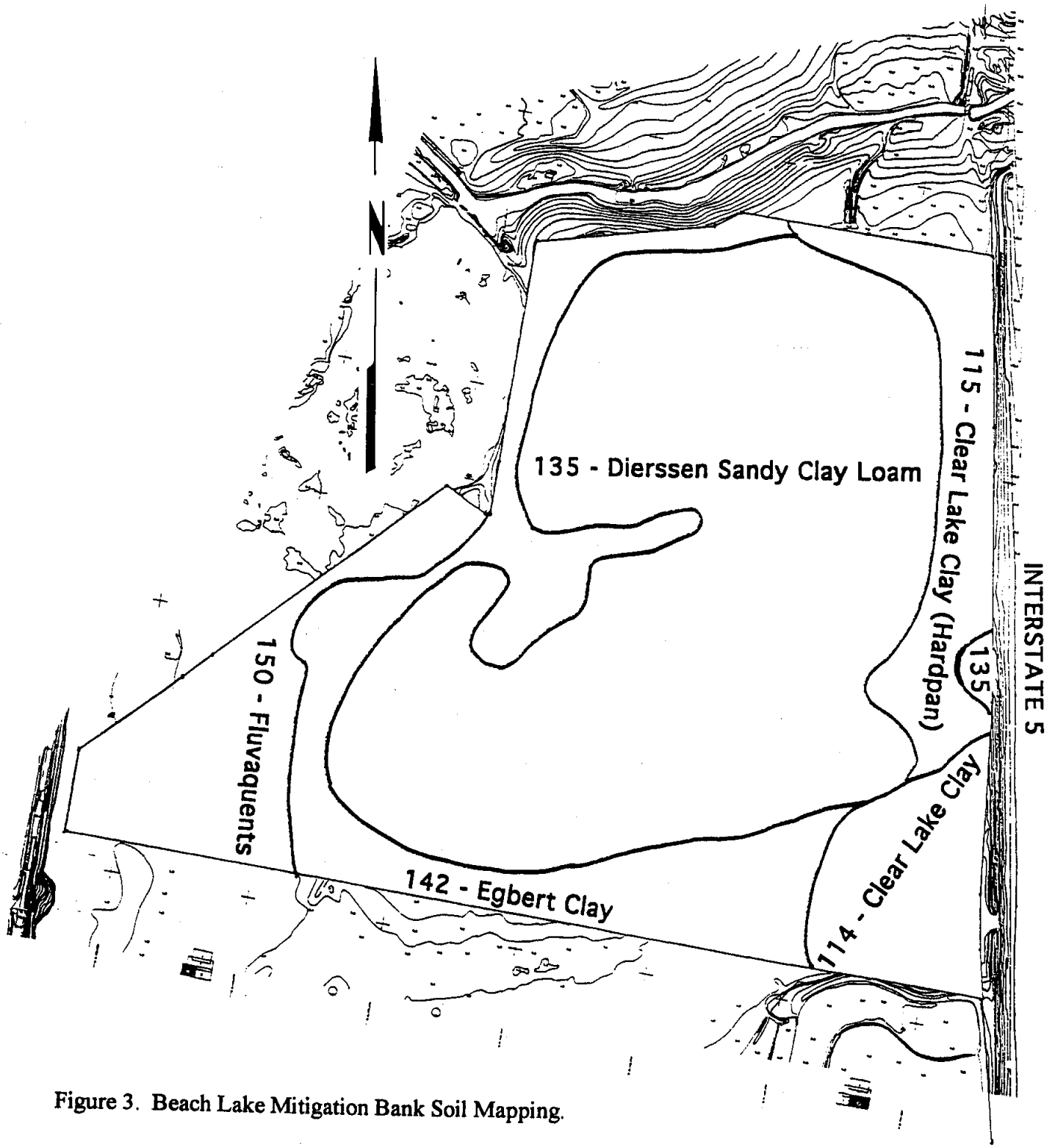


Figure 3. Beach Lake Mitigation Bank Soil Mapping.

part of the Riverbank terrace. Soils of this formation were partially eroded, exposing the duripan. With rising sea level following the Pleistocene, sediment carried by backwater flooding deposited on the older duripan, forming the Clear Lake soil. Historic vegetation consisted of permanent and seasonal marsh species.

2.3.3 Dierssen Clay Loam - (SCS mapping unit #135)

Dierssen soils are a composite of old Riverbank terrace soils overlain with sediment from Sacramento River flood events. The underlying soil, if exposed, would be classified as a San Joaquin soil. One important characteristic of this soil is a duripan at a depth of about 0.91 m (3 feet) which restricts root establishment for woody species. Historically, soils within these map unit boundaries would have supported grassland vegetation. With periodic flooding from the Sacramento River and deposition of sediment, these soils had a perched water table during the spring. Seasonal marsh vegetation would have been present in depressions and lower areas with a transition to grassland at higher sites further from the river.

2.3.4 Egbert Clay - (SCS mapping unit #142)

Soils in this mapping unit are very similar to the following unit classified as Fluvaquents. The removal of leaves and organic material by farming causes this type to be classified as a mollisol since the dark upper horizon remains.

Egbert soils are frequently flooded, clay soils low in the floodplain. They are deep soils with high apparent water tables. The high water table limits the plant species which can grow there. Historic vegetation was dominated by freshwater marsh or riparian forest species depending upon depth and duration of flooding.

2.3.5 Fluvaquents - (SCS mapping unit #150)

Soils in this mapping unit are very similar to Egbert clay. Fluvaquents more closely represent the historic condition with a layer of leaves and detrital material overlying a dark upper horizon. Where farming has removed the detrital layer, an artifact of the classification system reclassifies the soil as a mollisol. At Beach Lake, fluvaquents are mapped in the lowest areas where water is either ponded or at the surface for most of the year. Current vegetation is freshwater marsh and riparian forest. Historic vegetation was probably almost entirely freshwater marsh.

2.4 VEGETATION

Plant communities within and adjacent to the BLMB project were referred where possible to the classification system developed by Holland (1986). Plant associations which could be classified using this method include Great Valley Cottonwood Riparian Forest, Great Valley Valley Oak Riparian Forest, Great Valley Willow Scrub, and Coastal and Valley Freshwater Marsh. Two

other communities which are present but for which no appropriate element exists within this system have been labeled as Seasonal Marsh and Ruderal. Descriptions of each community follow. Common names are generally as provided by Reed (1988) and are used in this discussion for plants representing each community. Taxonomic nomenclature for species identified for this project follows Reed (1988) and/or Hickman (1993) and is included as Appendix 10.2.

2.4.1 Great Valley Cottonwood Riparian Forest

The vegetation in the Great Valley Cottonwood Riparian Forest community requires substantial moisture and is found on fine textured alluvial soil along the margins of permanent water bodies.

This community type is found in two areas on the project site: Adjacent to Beach Lake at the southwest portion of the site, and bordering Morrison Creek to the north. The community found near Beach Lake is dominated by Goodding's Willow (*Salix gooddingii*) (approximately 70% occurrence of trees sampled), followed by Fremont Cottonwood (*Populus fremontii*) (25%). Saplings of Valley Oak (*Quercus lobata*), Goodding's Willow, and Arroyo Willow (*Salix lasiolepis*) are evident. There are also lianas of California Wild Grape (*Vitis californica*). The understory in this riparian forest community is not well developed. California Blackberry (Reed = *Rubus vitifolius*, Hickman = *Rubus ursinus*) and unvegetated ground make up the majority of understory in this community type.

The Great Valley Cottonwood Riparian Forest community along Morrison Creek is dominated by Goodding's Willow, followed by Common Buttonbush (*Cephalanthus occidentalis*), Northwest Willow (Reed = *Salix sessilifolia*, Hickman = *Salix exigua*), and Fremont's Cottonwood. The understory is primarily litter and woody debris with California Wild Grape, California Blackberry, Devil's Beggar-ticks (*Bidens frondosa*), Water Smartweed (*Polygonum amphibium*), and Rough Cocklebur (*Xanthium strumarium*).

2.4.2 Great Valley Valley Oak Riparian Forest

The Great Valley Valley Oak Riparian Forest, historically extensive along rivers and streams in the Sacramento and San Joaquin valleys, is now rare. A remnant of this Valley Oak riparian forest is located adjacent to the Great Valley Cottonwood Riparian Forest community along Morrison Creek.

The overstory in this community is composed almost exclusively of a single species, Valley Oak. A mid-story is virtually absent, with only an occasional large shrub of Brown Dogwood (*Cornus glabrata*) evident. The understory in this community consists primarily of California Blackberry and Poison Oak (*Toxicodendron diversilobum*) with lianas of California Wild Grape.

There is a greater species diversity found along a road cut and a clearing within this community type. In both of these areas there is an increase of grasses and the ruderal species associated with

disturbed sites.

2.4.3 Great Valley Willow Scrub

The Great Valley Willow Scrub community can be characterized as a dense, shrubby thicket dominated primarily by willows (*Salix* spp.). The soil is fine textured and receives substantial moisture. This community type is located primarily along the east side of Beach Lake.

The dominant species is Arroyo Willow. Goodding's Willow and Pacific Willow (*Salix lasiandra*) are present, but in much smaller numbers. The understory of this willow scrub community is primarily coarse woody debris and bare ground. There are also a large number of fallen trees which freely resprout from the trunk. The sparse understory vegetation consists of California Blackberry, Water Smartweed, Swamp Smartweed (*Polygonum hydropiperoides*), and Flatsedges (*Cyperus* spp.). Where standing water exists, emergent and rooted aquatic vegetation more typical of the Coastal and Valley Freshwater Marsh community occurs and there is much less evidence of fallen trees. Here the understory vegetation is Hard-stem Bulrush (*Scirpus acutus*), Narrow-leaf Cattail (*Typha angustifolia*), Floating Seedbox (*Ludwigia peploides*), and . water hyacinth.

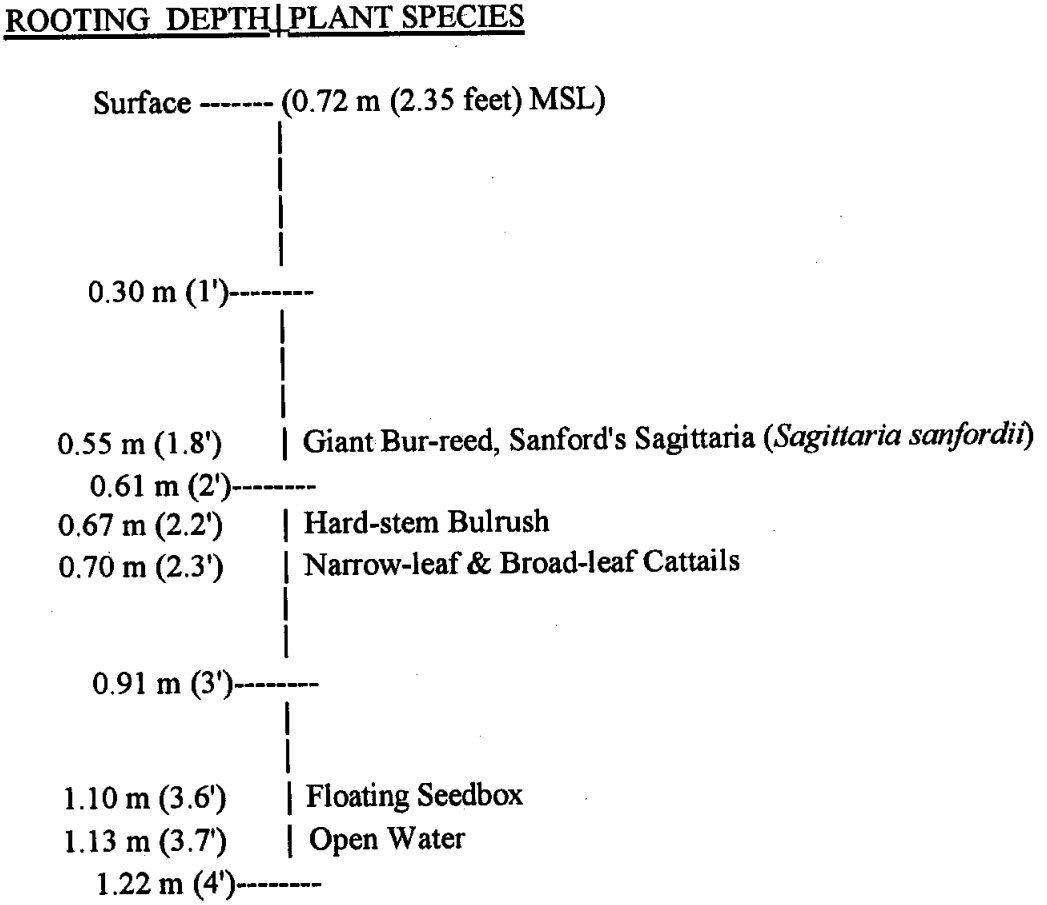
The Great Valley Willow Scrub community is also found in dense stands on higher ground adjacent to Beach Lake and Morrison Creek. These stands are dominated by Northwest Willow.

2.4.4 Coastal and Valley Freshwater Marsh

Coastal and Valley Freshwater Marsh vegetation occurs in calm water of the permanently flooded areas which lack significant current influence. Marsh vegetation occurs at the southwest portion of the site in Beach Lake and in areas of the permanent wetland along the southern boundary of the mitigation bank. The greatest percentage of this vegetation, found especially around the margins of the ponded area, can be characterized as dense stands of tall emergent vegetation dominated by Hard-stem Bulrush, Broad-leaf Cattail (*Typha latifolia*), Narrow-leaf Cattail, and Giant Bur-reed (*Sparganium eurycarpum*). Other areas, especially within the interior of Beach Lake, consist of scattered beds of rooted aquatic vegetation, almost exclusively Floating Seedbox. Starting in 1995, much of the open water area became quickly covered with water hyacinth and eradication efforts were begun during the summer and fall of 1995. The permanent, open water habitat to the south has also become invaded by water hyacinth, however, not at the densities found in Beach Lake.

Water depths for various species were measured in Beach Lake. Measurements were complicated by the presence of an unconsolidated bottom which varied from about 0.15 to 0.55 m (0.5 to 1.8 feet) in thickness. These measurements represent average depth to firm substrate below the unconsolidated material. Water levels in Beach Lake have increased approximately 0.30 m (one foot) in the past several years. This observation probably explains why emergent

vegetation is less extensive now than is indicated in photographs taken in 1986. Current vegetation is located at average depths indicated in the following illustration. It should be noted that water hyacinth occurs throughout Beach Lake with rooted mats along the shoreline and floating mats in deeper water.



2.4.5 Seasonal Marsh

The Seasonal Marsh community is represented at the southern boundary of the project site. This area was originally part of the adjacent agricultural field, but it has been permanently inundated with water as a result of construction in 1991 of a private wetland mitigation project located south of the BLMB. The soil in this area was saturated or inundated when sampled in September 1991. The seasonal marsh community is now limited to the margins of the inundated areas that are subject to water depth fluctuations in the permanent marsh.

The vegetation in this community is dominated by grasses and herbaceous annuals and perennials. The dominant species are Barnyard Grass (*Echinochloa crusgalli*) and Water Smartweed. Also common are Willow-weed (*Polygonum lapathifolium*), Redroot Flatsedge

(*Cyperus erythrorhizos*), Tall Flatsedge (*Cyperus eragrostis*), Annual Saltmarsh Aster (*Aster subulatus*), Nodding Beggar-ticks (*Bidens cernua*), and Rough Cocklebur. In a permanently saturated condition, this area will progressively become dominated with emergent vegetation typical of the Coastal and Freshwater Marsh community.

Since 1993, vegetation characteristic of the Coastal and Freshwater Marsh community was establishing at this location. Additionally, Fremont Cottonwood seedlings were establishing in the saturated soils adjacent to the inundated area.

2.4.6 Ruderal

A ruderal vegetation community consisting primarily of non-native species occurs in the areas that have been disturbed by farming, road cuts, herbicide application, etc. These ruderal areas are generally found at the edges of the previously described communities and within the agricultural fields.

The former agricultural fields, the largest area of the project site, have been previously cultivated primarily with corn and safflower. These fields had been periodically disced for weed control. The predominant vegetation found in the disced areas is Field Bindweed (*Convolvulus arvensis*). Dominant vegetation in the absence of discing consists of Black Mustard (*Brassica nigra*) and other annual species. Areas receiving more ground moisture support stands of Water Smartweed which have developed extensive root systems penetrating to groundwater.

Along the field margins, the land is disturbed, but not frequently disced. A wider variety of species occurs at this location, dominated by Sweet Fennel (*Foeniculum vulgare*), Broad-leaf Peppergrass (*Lepidium latifolium*), Star Thistle (*Centaurea solstitialis*), White Sweetclover (*Melilotus alba*), Prickly Lettuce (*Lactuca serriola*), Common Sunflower (*Helianthus annuus*), Rough Cocklebur, and Black Mustard.

Within the fields are areas that are not disced because of obstructions, such as utility poles and berms. Here is possible evidence of the successional stages of vegetation in these disturbed areas. The areas disced most recently are dominated by Star Thistle. At the older sites there is a higher diversity of non-native species. Himalaya Blackberry (*Rubus discolor*) and scattered Valley Oak seedlings are also evident. If these seedlings survive, shade develops and a dense understory of Himalaya Blackberry and Poison Oak dominates.

2.5 WILDLIFE

2.5.1 Mammals

As part of site investigations for this project, data on mammals currently using the BLMB and adjacent habitats were collected by observation, live trapping, and contacts with local residents

(Appendix 10.3).

Beach Lake was found to support furbearers characteristic of permanently flooded freshwater marsh, including Beaver (*Castor canadensis*), Muskrat (*Ondatra zibethica*), River Otter (*Lutra canadensis*), and Mink (*Mustella vison*).

The ruderal margins of the farmed portion of the property provide habitat for small rodents including (in order of abundance) Deer Mice (*Peromyscus maniculatus*), House Mice (*Mus musculus*), Harvest Mice (*Reithrodontomys megalotis*), California Meadow Voles (*Microtus californicus*), Black Rats (*Rattus rattus*), and Ornate Shrew (*Sorex ornatus*).

The cottonwood riparian forest, willow scrub, and valley oak forest habitats have very low populations of small mammals consisting mainly of Deer Mice, Black Rats, and House Mice, although a single Ornate Shrew was also captured here.

Other mammals trapped or observed included California Ground Squirrel (*Spermophilus beecheyi*), Pocket Gopher (*Thomomys bottae*), Audubon's Cottontail (*Sylvilagus audubonii*), Black-tailed Jackrabbit (*Lepus californicus*), Opossum (*Didelphis virgiana*), Striped Skunk (*Mephitis mephitis*), Mexican Free-tailed Bat (*Tadarida brasiliensis*), Raccoon (*Procyon lotor*), Red Fox (*Vulpes fulva*), and Coyote (*Canis latrans*). Residents of the Beach Lake area also reported observations of Spotted Skunk (*Spilogale putoris*) and Gray Fox (*Urocyon cinereoargenteus*) near Beach Lake.

For the most part, the mammal study (Wyatt, et.al., 1991) produced few surprises with regard to the mammal fauna. Mammal populations in this setting are affected by agricultural activities which greatly modify habitat characteristics. Floods, particularly those on the scale of the 1983, 1986, 1993, and 1995 events can also have dramatic impacts on mammal populations. Terrestrial mammals which cannot climb trees must find high ground to survive. Such refugia are very limited in the Beach/Stone Lakes Basin. Low populations of larger mammals are probably a consequence of such floods, along with habitat fragmentation and frequent disturbances. Low numbers of small mammals such as California Ground Squirrels and Cottontails and the absence of Western Gray Squirrels (*Sciurus griseus*) are possibly explained by the limited availability of foraging habitat or, in the case of the Gray Squirrel, the recent development of suitable habitat which is isolated from occupied areas (Wyatt, et. al., 1991).

The restoration of wetland and riparian habitats would result in substantially more habitat available for colonization by these mammals. The creation of upland flood refugia would also facilitate survival of more mammals during periodic flood events.

2.5.2 Birds

Caltrans has not systematically collected data on bird use of the BLMB and adjacent habitats.

Observations during several field visits have been recorded (Appendix 10.4) however, and data exists for other nearby parcels (Zentner and Zentner, 1990; EA Engineering, Science and Technology, 1990). Based on these observations, the agricultural/ruderal portions of the property appear to provide low habitat values for birds. This habitat did not support substantial use by a diversity of bird species.

Beach Lake is too deep to provide high quality habitat for smaller shorebirds and dabbling ducks. Species which do make extensive use of the habitat include Great Blue Heron (*Ardea herodias*), Great Egret (*Casmerodius albus*), American Coot (*Fulica americana*), Pied-billed Grebe (*Podilymbus podiceps*), and Double-crested Cormorant (*Phalacrocorax auritus*). The highest densities of bird use occur seasonally during January through March. Migratory waterfowl using the area include Mallards (*Anas platyrhynchos*), Green-winged Teal (*Anas carolinensis*), Cinnamon Teal (*Anas cyanoptera*), Northern Shoveler (*Anas clypeata*), Northern Pintail (*Anas acuta*), and Gadwall (*Anas strepera*). Wood Ducks (*Aix sponsa*) use Stone Lake Slough and Morrison Creek. Mallards and Wood Ducks are the only permanent resident species of waterfowl. White Pelicans (*Pelecanus erythrorhynchos*) use Beach Lake in the winter and early spring.

The basins excavated for borrow material in 1992 and 1993 provide a ponding area for surface runoff and floodwaters and have remained ponded each year through the early spring months. Great Egrets have been frequently observed foraging along the bottoms of the basins. In addition to the Great Egrets, White Pelicans are also frequent visitors to the flooded basins. Other bird species observed in the excavated basins include Great Blue Herons, Snowy Egrets (*Egretta thula*), Double-crested Cormorants, and Mallards.

Cottonwood riparian forest and valley oak forest provide good habitat for many migratory and resident species. A partial list of observations include Scrub Jay (*Aphelocoma coerulescens*), Yellow-rumped Warbler (*Dendroica coronata*), Starling (*Sturnus vulgaris*), Bewick's Wren (*Thryomanes bewickii*), and California Quail (*Callipepla californica*). At the BLMB these habitat types are important resources, but are limited in extent. In particular, habitat patches are generally narrow. Proposed restoration work would greatly improve values by increasing the size of habitat patches.

2.5.3 Reptiles and Amphibians

No intensive surveys were made for reptiles and amphibians. Casual observations in 1991 were made of Gopher Snakes (*Pituophis melanoleucus*), Garter Snakes (*Thamnophis sirtalis*), Western Pond Turtles (*Clemmys marmorata*), and Bullfrogs (*Rana catesbeiana*). No Western Pond Turtles have been observed at Beach Lake since the sightings in 1991. The Giant Garter Snake (*Thamnophis gigas*) is documented in the California Natural Diversity Data Base (CNDDB) as present in Beach Lake and was confirmed with a visual sighting by CDFG biologist Tim Nosal on July 19, 1992.

It is unknown if flood events have resulted in inundation of hibernicula at Beach Lake. Due to the general lack of floodwater refugia at Beach Lake, it would be expected that such high water flood events would submerge hibernicula, thus resulting in the death of burrow residents. The restoration and enhancement at BLMB would create areas that would be expected to remain above flood water levels during an usual flood event and in some above normal flood events. These areas of "high ground" would serve as effective refuges from high water levels at the BLMB.

2.5.4 Fish

Sampling to inventory the fish fauna of Beach Lake was conducted on October 22, 1993 and May 21, 1994. Sampling on October 22, 1993 was conducted by the CDFG and Dr. C. David Vanicek of the California State University, Sacramento (CSUS), with assistance from several of Dr. Vanicek's fishery students and Caltrans biologists. Two flat-bottomed electofishing boats were used to momentarily stun the fish which were then netted and placed in a live-well for later identification. After the electofishing boats returned to shore, each fish was identified and its body length measured to the nearest millimeter. Several fish were preserved in a formalin solution and returned to the laboratory at CSUS to confirm their identification. Approximately three hours were necessary for the electrofishing and field identification. A total of 14 species of fish were captured and identified using electrofishing.

Sampling on May 21, 1994 was conducted by Jim Canaday and David Wyatt from American River College and assisted by James Navicky. This survey primarily occurred adjacent to the dam (dike) separating Beach Lake from Morrison Creek. Three passes were conducted using a 12.19 m (40-foot) beach seine and four passes using a 7.62 m (25-foot) beach seine. A total of 184 fish (16 species) were captured using this sampling method. Bluegill (*Lepomis macrochirus*) and Brown Bullhead (*Ictalurus nebulosus*) were the most abundant accounting for 70 fish and 39 fish respectively.

The following are the results of fishery surveys at Beach Lake on October 22, 1993 and May 21, 1994:

Common Name	Scientific Name	Method of Capture
Goldfish	*Carassius auratus*	Electrofishing
Sculpin	*Cottus* sp.	Seine
Carp	*Cyprinus carpio*	Electrofishing & Seine
Threadfin Shad	*Dorosoma petenense*	Electrofishing
Mosquitofish	*Gambusia affinis*	Electrofishing
Brown Bullhead	*Ictalurus nebulosus*	Electrofishing & Seine
Green Sunfish	*Lepomis cyanellus*	Electrofishing
Warmouth	*Lepomis gulosus*	Electrofishing & Seine
Bluegill	*Lepomis macrochirus*	Electrofishing & Seine
Redear Sunfish	*Lepomis microlophus*	Electrofishing
Inland Silverside	*Menidia beryllina*	Electrofishing & Seine
Largemouth Bass	*Micropterus salmoides*	Electrofishing & Seine
Golden Shiner	*Notoemigonus crysoleucas*	Electrofishing
Bigscale Logperch	*Percina macrolepida*	Seine
White Crappie	*Pomoxis annularis*	Electrofishing & Seine
Black Crappie	*Pomoxis nigromaculatus*	Electrofishing & Seine

These results are similar to the findings from fishery surveys conducted at North Stone Lake in 1989 and 1990 (EA Engineering, Science and Technology, 1990). The North Stone Lake studies used CDFG flat-bottomed electrofishing boats as the method of capture and found a total of 17 species. A comparison between the Beach Lake and North Stone Lake surveys finds that four species captured at North Stone Lake were not captured at Beach Lake and three species captured at Beach Lake were not captured at North Stone Lake. The four species from North Stone Lake were: Sacramento Blackfish (*Orthodon microlepidotus*), Hitch (*Lavinia exilicauda*), White Catfish (*Ictalurus catus*), and Black Bullhead (*Ictalurus melas*). The three species from Beach Lake were: Green Sunfish, Redear Sunfish, and Golden Shiner.

A glimpse of the prehistoric inventory of fish species in the Stone Lake area was provided by a study conducted in 1972 by Peter Schulz and Dwight Simons from the Department of Anthropology at the University of California, Davis (Schulz and Simons, 1973). This study analyzed the fish remains from the midden of an aboriginal fishing village situated on the south shore of Stone Lake. This village was located in the historic territory of the Cosomne tribelet of the Plains Miwok and radiocarbon dates from the site indicate an occupation from approximately 1,000 to 200 years before present. Twelve species of fish were identified from the midden and a total of 804 individual fish were represented in the examined material. Sacramento Perch (*Arcoplites interruptus*) accounted for 51.0% of the fish in the sample with Hitch second most abundant (20.0%) and Thicktail Chub (*Gila crassicauda*) third most abundant at 12.4% of the midden sample. The following are the fish species identified by Schulz and Simons (1973):

Common Name	Scientific Name
Sacramento Perch	*Archoplites interruptus*
Hitch	*Lavinia exilicauda*
Thicktail Chub	*Gila crassicauda*
Splittail	*Pogonichthys macrolepidotus*
Sacramento Sucker	*Catostomus occidentalis*
Sacramento Blackfish	*Orthodon microlepidotus*
Tule Perch	*Hysterocarpus traski*
Hardhead	*Mylopharadon conocephalus*
Sacramento Squawfish	*Ptychocheilus grandis*
King Salmon	*Oncorhynchus tshawytscha*
Sculpin	*Cottus* sp.
Sturgeon	*Acipenser* sp.

As evidenced from the Beach Lake and North Stone Lake surveys, the majority of these species appear to be extirpated from the Beach/Stone Lakes basin or are now in such small numbers that they did not appear in the sampling. One of these species, the Thicktail Chub, is believed to be extinct. The North Stone Lake study found Sacramento Blackfish and Hitch in the samples and both the North Stone Lake and Beach Lake samples found Sculpins.

2.6 THREATENED AND ENDANGERED SPECIES

The following sensitive species are listed by the CNDDB as having been recorded in the vicinity of the BLMB. For purposes of this discussion, the CNDDB was searched for occurrences of sensitive species in four Township/Ranges (T/R): T6N R4E, T6N R5E, T7N R4E, and T7N R5E. The BLMB is located in Sections 24 and 25 of T7N R4E. Only species already listed as Endangered or Threatened are discussed. The other sensitive plant and animal species known to exist within the area but not discussed further are: Tricolored Blackbird (*Agelaius tricolor*), Rookery - Great Blue Heron, Burrowing Owl (*Athene cunicularia*), Rookery - Great Egret, Western Pond Turtle, Black-shouldered Kite (*Elanus caeruleus*), Legenere (*Legenere limosa*), Rookery - Double-crested Cormorant, and Sanford's Sagittaria. The BLMB could provide additional habitat for these species except Legenere, a vernal pool species.

Swainson's Hawk (*Buteo swainsoni*) - A State listed Threatened species, there are several occurrences near the BLMB identified in the CNDDB. The majority of these occurrences are to the northeast of the BLMB, along and adjacent to the Sacramento River. Several more occurrences occur to the south and southwest. Several individuals of this species have been observed flying over the BLMB project site, but none have been found nesting on the property. Mammal trapping for this project (2,719 trap-nights) demonstrated that the property did not support preferred prey species (meadow voles) in numbers useful to the Swainson's Hawk. Seasonal wetlands and upland habitats proposed for the BLMB will significantly improve foraging opportunities for this raptor (Wyatt, et. al., 1991). Maturing riparian forest could eventually provide additional nesting opportunities.

Giant Garter Snake (*Thamnophis gigas*) - State and Federally listed as Threatened there is a 1992 CNDDB record of this species occurring in Beach Lake. On July 19, 1992, Department of Fish and Game Wildlife Biologist Tim Nosal observed a Giant Garter Snake east of the Beach Lake dike at Beach Lake. The snake was feeding on a Bullfrog when observed. Additional records exist for observations in wetlands of the Laguna and Morrison Creek watershed east of the BLMB. Restoration of seasonal and permanent freshwater marsh habitats at BLMB will be beneficial to the species and the establishment of higher ground areas in the BLMB will provide flood refugia and further opportunities for hibernacula.

Western Yellow-Billed Cuckoo (*Coccyzus americanus occidentalis*) - A State listed Endangered species, there are historic records of this bird in riparian forests along the Sacramento River. The CNDDB identifies an extirpated occurrence to the southwest of the BLMB along the Sacramento River. There are no recent observations in the vicinity of the BLMB. The Western Yellow-Billed Cuckoo is generally found in habitat similar to the Cottonwood and Willow forest adjacent to the southwest corner of the BLMB. However, at present this particular riparian area is probably too small to serve as suitable nesting habitat. Gaines and Laymon (1984) report that most breeding sites surveyed in California were characterized by willows, dense low-level or understory foliage less than 10 m (32.8 feet) in height, high humidity associated with the

presence of surface water, and a suitable habitat breadth in excess of 120 m (393.7 feet) in width and 10 ha (24.7 acres) in area. With restoration efforts of riparian habitat on the BLMB and other nearby properties, suitable habitat may exist in future years.

Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*) - This Federally listed Threatened species is present in areas along the Sacramento, American, Cosumnes, and Mokelumne Rivers. The host Mexican Elderberry (*Sambucus mexicana*) is present in some areas of the existing riparian portions of the BLMB, however, no beetle emergence holes were observed in these plants. These riparian areas will not be impacted by construction of the BLMB. Additional plantings of this plant in the riparian component of the BLMB may increase potential habitat for the species.

2.7 INFRASTRUCTURE CONSIDERATIONS

2.7.1 Access

Access to the BLMB is by one of several routes through adjoining properties. There is no access from Interstate 5. Two methods of access are available from north of the BLMB and one access method from south of the BLMB. All access points are controlled by locked gates. From north of the BLMB, entry is obtained from Route 160 north of Morrison Creek, opposite Cliff's Marina, then through Sacramento Regional Wastewater Treatment Plant property crossing over Morrison Creek to the west of Interstate 5. The other northern entrance is by Beach Lake Road located on the Sacramento Regional Wastewater Treatment Plant Buffer Lands. Beach Lake Road is located on the east side of Interstate 5 and is accessed from State Route 160 by the Stonecrest Road overcrossing. At it's terminus, Beach Lake Road becomes a dirt road that crosses under Interstate 5 at the Beach Lake Bridge and crosses Morrison Creek to the west of Interstate 5. Entry can be obtained from south of the BLMB by a dirt and gravel road located in the Stone Lakes National Wildlife Refuge. The Refuge is accessed through a locked gate located to the west of Interstate 5 at the Elk Grove Boulevard Interchange.

Often, storms and flooding events result in increased water levels in the Morrison Creek and North Stone Lake basins. These increased water levels will periodically inundate water crossings both north and south of the BLMB, thereby effectively isolating the BLMB parcel. Additionally, the wintertime water saturated soils on the BLMB parcel and adjacent lands make vehicle access difficult or impossible even when the northern (Morrison Creek) crossing and southern crossing are passable.

2.7.2 Easements

One easement and one encumbrance occur on the BLMB. The easement is a utility access easement owned by the Sacramento Municipal Utility District. The easement follows the power line which runs north-south along the westerly portion of the three parcels. An existing roadway

is present for access to this powerline easement. This roadway will not be adversely impacted by the restoration activities scheduled on the BLMB. Access for power line repair and removal of interfering vegetation will be maintained.

The encumbrance is retention of subsurface mineral rights on all three parcels by the previous landowner. These subsurface mineral rights are located at least 30.48 m (100 feet) below the soil surface therefore would require approval by the current landowner for a right of surface access.

2.8 CULTURAL RESOURCES

A cultural resources inventory was conducted of the BLMB area by Caltrans cultural resources personnel. The study also involved coordination with the Native American Heritage Commission, local Native American representatives, the Sacramento County Historical Society, and the North Central Information Center of the California Archaeological Inventory, California State University, Sacramento.

Two prehistoric archaeological sites, identified as CA-SAC-84 and CA-SAC-327, had been previously recorded within or adjacent to the boundaries of the BLMB. Backhoe trenching was used to confirm the boundaries of one site (CA-SAC-84) while trenching revealed that the second site (CA-SAC-327) is not located within the limits of the BLMB. Representatives of the Miwok Nation were present during excavation activities and no artifacts were collected from the sites.

The BLMB has been designed around CA-SAC-84 in order to avoid and preserve the site. The site will be fenced and designed as an environmentally sensitive area during construction activities to ensure protection during construction of the project. A 15.24 m (50-foot) buffer was added to the site boundaries as further protection. Because CA-SAC-84 will not be impacted by the BLMB development and CA-SAC-327 is not located within the parcel boundaries, the BLMB will have no effect on cultural resources (Offerman, 1992; Offerman, 1993).

3.0 RESTORATION CONCEPTS

Historic wetlands in the Beach/Stone Lakes Basin were subject to highly variable hydrologic conditions among and within years. The hydrologic alterations discussed previously in Section 2.2.2 (Modern Hydrology) have tended to drain most wetlands and stabilize water levels in those that remain. Seasonal wetlands, in particular, are far less extensive and have been restricted to much shorter periods of inundation and saturation. Current "natural" hydrology cannot re-create those seasonal habitats. Consequently, design and management of restored habitats must account for this.

Proposed landscape modifications are intended to provide wetland hydrology for seasonal marsh, permanent marsh, and woody riparian habitats. Methods for accomplishing this fall into the

categories of excavation and water control structures. Excavating soil from portions of the site will bring soil surfaces closer to perched and apparent water tables. This will be most useful on Dierrsen soils where perched water tables in the winter and spring can support hydrophytes. Apparent water tables on Egbert soil are too deep to reach by excavation. Excavation will also increase the frequency and duration of on-site flooding. Excavation alone, however, will not be adequate for restoration of permanent marsh, and seasonal marshes created using this method would have short hydroperiods lasting only from late winter to early spring. Facilities such as dikes, alfalfa valves, and flashboard structures are proposed to increase the duration of ponding and soil saturation. Such efforts would enhance wetland functions such as flood storage, water quality, and groundwater recharge. Longer periods of wetland hydrology would also support more plants classified as Obligate and Facultative Wetland species (Reed, 1988) and fewer annual upland species. Habitat values for wetland dependent wildlife would also be higher with a longer period of wetland hydrology.

To create permanent marsh and seasonal wetlands which emulate historic habitats, a managed water delivery system has been developed. Water control features (i.e. alfalfa valves and flashboard structures) can be used to deliver water, control depths, and drawdown water at desired times. The design will utilize a high volume submersible pump to draw water from a sump located in Beach Lake. A 0.46 m (18 inch) plastic (PVC) irrigation pipe (SDR 51, rated 80 psi) extends from the pump structure to the wetland units for a linear extent of 762 m (2,500 feet). For water inlets, manually operated 0.38 m (15 inch) alfalfa valves are placed along the PVC irrigation pipe to convey the water to the seasonal and permanent wetlands. Manually operated flashboard structures, also known as stoplog structures and half-round riser structures, will be utilized as the control mechanism for outlet of water from the wetland units. The flashboard structure is constructed of 0.91 m (36 inch diameter) corrugated metal pipe (12 gage galvanized steel) with 4.76 mm (3/16 inch) welded plate steel or molded plate steel channels for placement of flashboard or stoplog boards. The entire flashboard structure bisects the dike or levee with the flashboard (stoplog) end of the structure located on the wetland side of the dike and the open end of the corrugated metal pipe located on the drainage side of the dike. The flashboards (stoplog boards) themselves are kiln dried redwood or Douglas fir 5.0x15.2 cm (2x6 inch) boards without knots or knotholes. These boards act as a "dam" to impound water in the wetland units. Water levels in the wetlands are easily manipulated by inserting or removing boards from the structure. In order to prevent tampering or vandalism of the flashboards, brass padlocks will be installed in the plate steel channels.

Planning issues considered in developing this design included anticipated mitigation needs, needs of individual target wildlife and plant species, topography, soils (particularly the extent and depth of duripan), maintenance access, cost (particularly of earthwork), provision of electrical power, availability of water, ecotonal effects, flood hydrology, and existing utility easements.

The project site designs are illustrated in Figures 4, 5, 6, and 7.

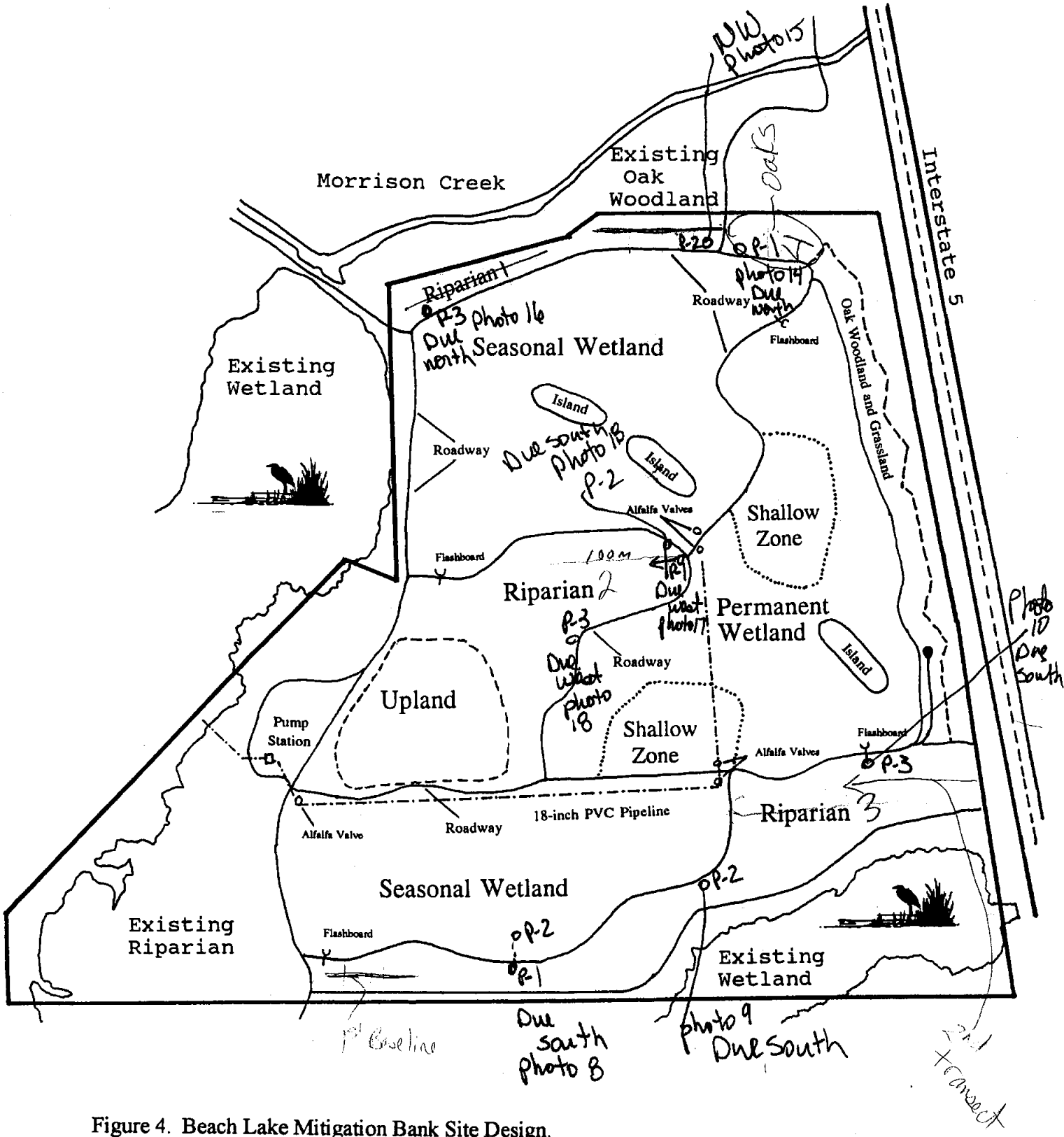


Figure 4. Beach Lake Mitigation Bank Site Design.

P-# = photo point

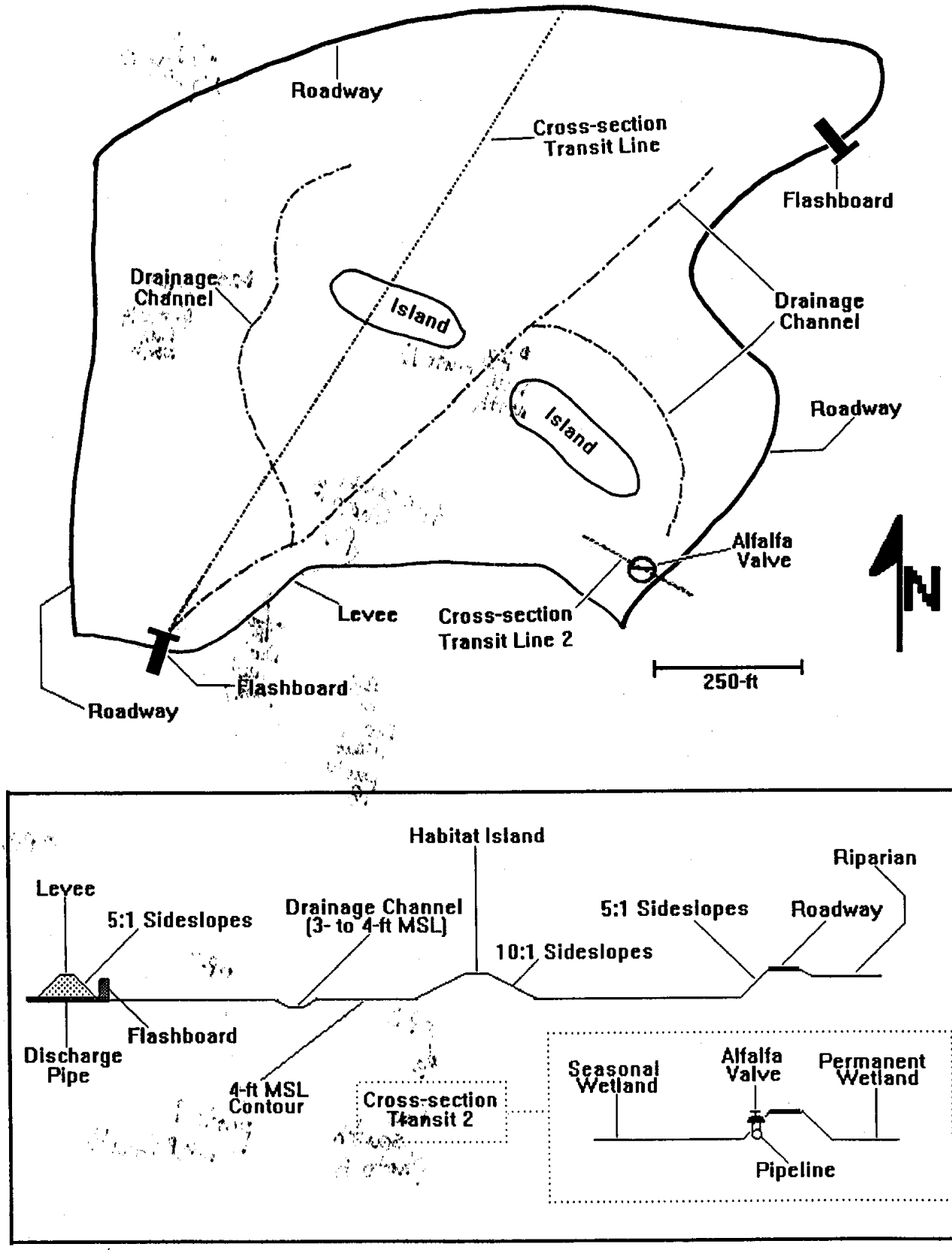
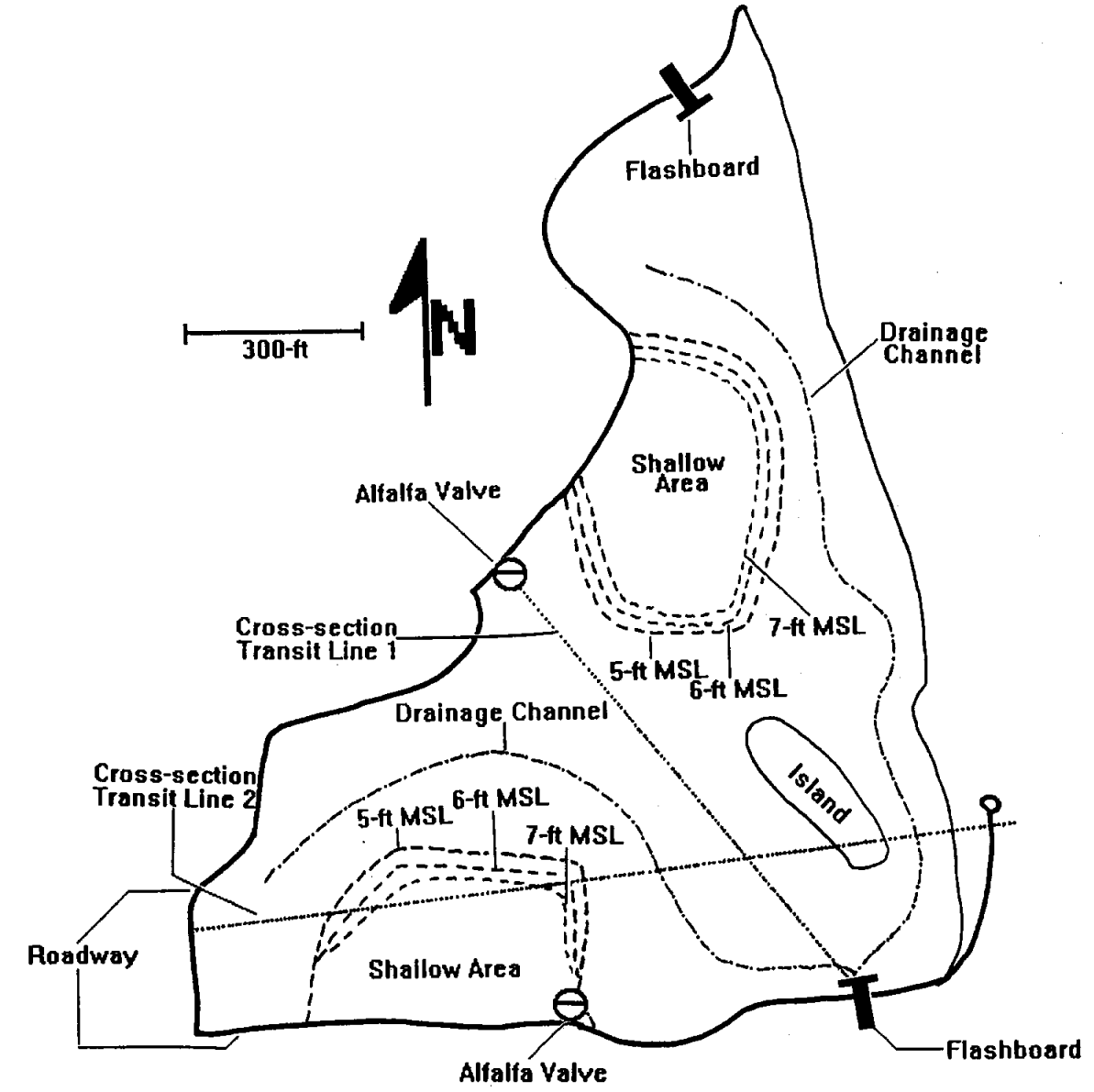


Figure 5. Beach Lake Mitigation Bank, Wetland #1, Seasonal Wetland.



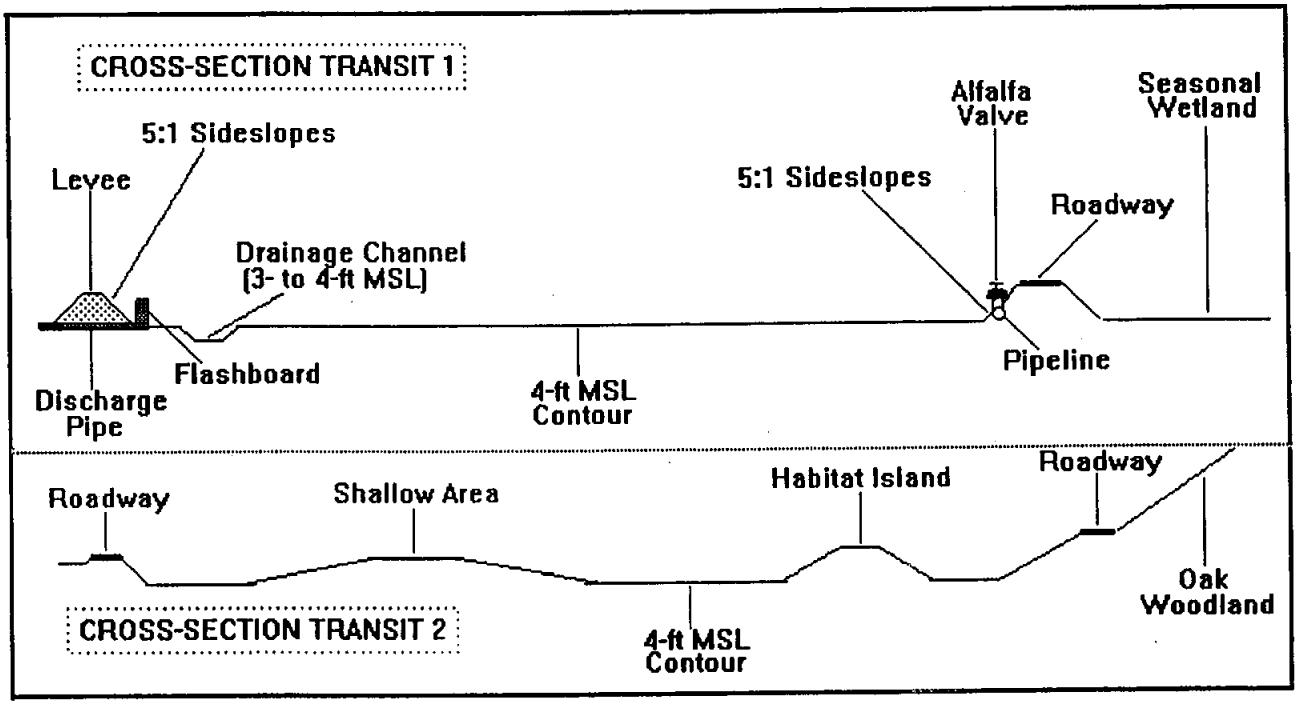
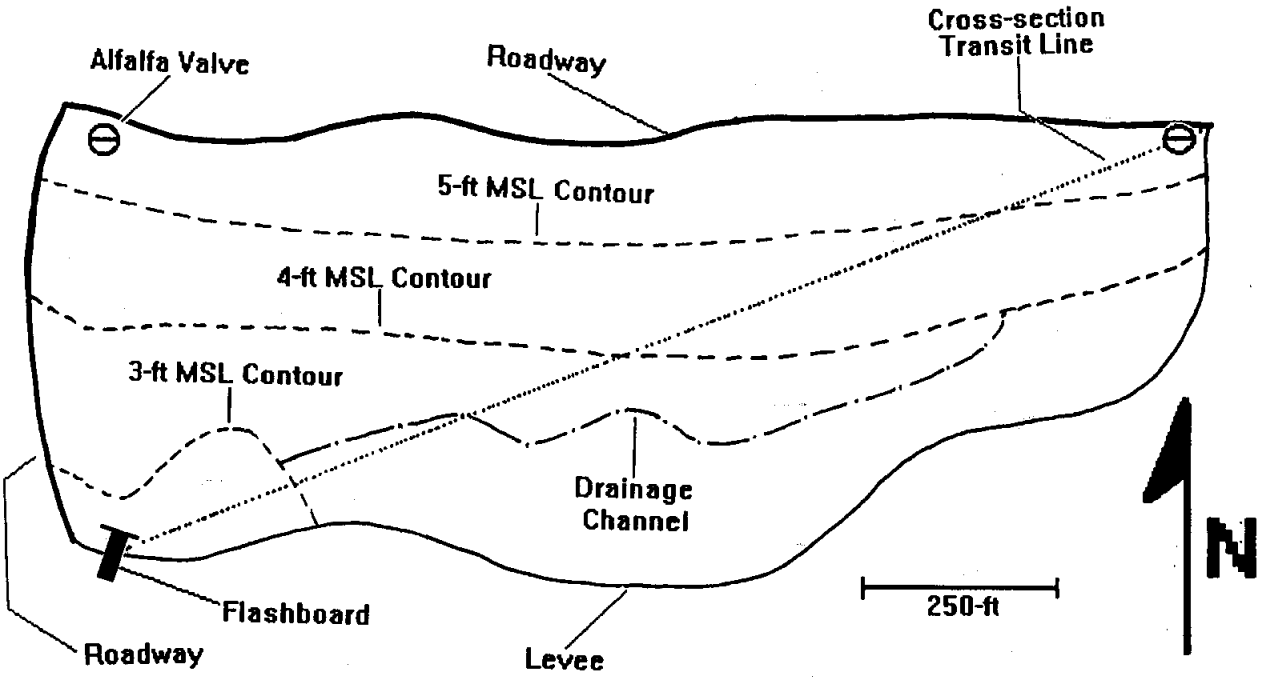


Figure 6. Beach Lake Mitigation Bank, Wetland #2, Permanent Wetland.



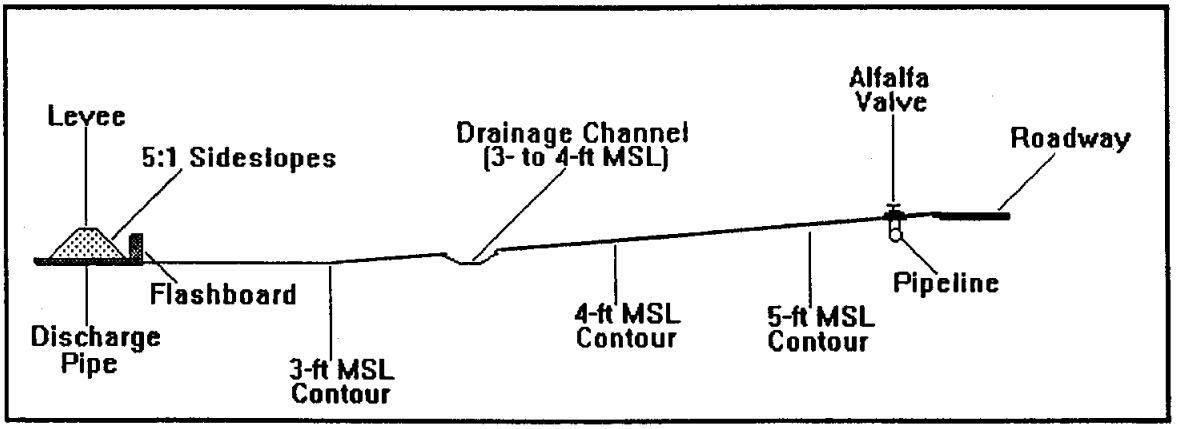


Figure 7. Beach Lake Mitigation Bank, Wetland #3, Seasonal Wetland.

3.1 HABITAT TYPES

The following habitat types were selected because suitable soils are present, hydrologic considerations are manageable, these types are present in the Beach Lake area, and because of anticipated mitigation needs.

3.1.1 Seasonal marsh

Management of these units is intended to encourage development of a flora which will provide high quality forage and cover for wintering and migrating waterfowl, shorebirds, and other wetland dependent species. Typical plant species in the BLMB area include the following potential target species:

Common Name	Scientific Name
Barnyard Grass	*Echinochloa crusgalli*
Bearded Sprangletop	*Leptochloa fascicularis*
Swamp Timothy	*Crypsis schoenoides*
Creeping Spike-rush	*Eleocharis macrostachya*
Annual Smartweeds	*Polygonum* spp.
Flat Sedges	*Cyperus* spp.
Rushes	*Juncus* spp.
Sedges	*Carex* spp.

The only seasonal wetland habitats currently at the BLMB are found along the margins of permanent freshwater marsh, mainly along the recently flooded slough on the southern property boundary. Seasonal wetland vegetation found there now will probably be eventually replaced by natural succession resulting in perennial species (e.g. Cattails, Giant Bur-reed, and Hard-stem Bulrush). On drier ground, Willows and Fremont Cottonwood will probably become dominant.

All of the above species are present as natives or naturalized exotics in seasonal wetlands at the BLMB. These species generally produce abundant seed crops and support invertebrates in numbers, biomass, and diversity important to water birds.

In most cases where the above species are desired, no seeding is necessary. Seeds are present in large numbers within the soil and are transported by water and birds. For the BLMB, however, seed banks will be removed or degraded by construction activities. To accelerate plant establishment, seasonal marshes will be inoculated with top soil from the site prior to flooding. The residual seed bank is expected to include seeds in sufficient number and diversity for this purpose.

To restore seasonal marshes which mimic historic wetlands found in the Beach/Stone Lake area, an important element is the inclusion of disturbance factors during operation which will maintain

seasonal marshes in early successional stages. As occasional planned disturbances become necessary to maintain high quality seasonal wetland habitat, the appropriate resources agency (i.e. USFWS and/or CDFG) will be consulted to develop the appropriate disturbance methodology. Unplanned but probable disturbances will include wildfires and exposure on an unpredictable frequency to major flood events. Because of the location and soils of the BLMB, flooding is not likely to cause substantial erosion or damage. As floodwaters recede there will be some deposition of sediments from the water column.

Of the proposed wetland habitats, seasonal wetlands will be the most extensive, covering approximately 44 acres. One important design consideration was to put marsh habitat on soils which minimize water loss through percolation and which would not have suitable rooting depths for trees and shrubs. Dierssen clay loam was targeted for these reasons. On-site investigations have determined that hardpan is less extensive than indicated by existing mapping. However, the clay fraction of non-hardpan soils is sufficiently high for purposes of ponding water and discouraging deep root establishment.

Seasonal marshes are divided into two units, with the potential to manage each unit differently. One unit is sloped from an elevation of 5' MSL to 3.5' MSL to provide variable depths during flood-up. The other unit does not have sloping and is at an elevation of 4' MSL. Water intake structures (screw gates) are located at the high end of the sloping wetland and water level control structures (flashboard structures) are at the low end. This design facilitates some diversity in water depth over a unit thereby enhancing wildlife values, concentrates invertebrates during drawdown, and improves the ability to drain the unit quickly if mosquitoes become a problem. The constant sloped seasonal unit is equipped with various channels to facilitate rapid drawdown and concentrates invertebrates during drawdown.

Management prescriptions will generally follow the principles of moist-soil management with flooding in the fall until spring. Management of the three units can be rotated among different strategies from one year to the next. This maintains seasonal wetlands in early successional phases which are valuable for wildlife. With experience and monitoring, management prescriptions can be altered to reflect the physical mechanics of actually managing the property, and the responses of plants and wildlife to different site specific management.
Each unit includes a small component of deeper water (e.g. channels and potholes). This would increase edge habitat and provide a refugium to maintain aquatic vertebrate and invertebrate populations during drawdown. Each unit would be drawn down completely in the summer. One of the units includes two islands for loafing and early spring nesting by waterfowl and shorebirds.

Periodic disturbances developed in consultation with USFWS and/or CDFG will be used to control perennial freshwater marsh species (e.g. Cattail and Tules). This management strategy emulates historic seasonal wetlands in the Beach/Stone Lake basin which are no longer present because hydrology has been substantially modified.

3.1.2 Permanent Marsh

Permanent marsh provides important resting and escape habitat for many birds and nesting opportunities for several colonial species (e.g. Tricolored Blackbirds, Black-crowned Night Herons (*Nycticorax nycticorax*), White-faced Ibis (*Plegadis chihi*)). Both wintering and breeding populations of waterfowl and resident wildlife benefit by the presence of water ponded year-round. Open water within the marsh provides foraging habitat for diving ducks, coots, grebes, and others. In addition, the freshwater marsh will support various populations of fish, mammal, amphibian, and reptile species.

Vegetation within permanent wetlands adjacent to the BLMB site provide a list of potential target species for the restoration of permanent marsh at the BLMB. The existing Coastal and Valley Freshwater Marsh at Beach Lake and adjacent marshlands are typically dominated by the following species:

Common Name	Scientific Name
Narrow-leaf Cattail	*Typha angustifolia*
Broad-leaf Cattail	*Typha latifolia*
Hard-stem Bulrush	*Scirpus acutus*
Giant Bur-reed	*Sparganium eurycarpum*

Hard-stem Bulrush and Giant Bur-reed generally provide better habitat for wildlife than Cattails. Consequently some planting is intended for these two species. Since Hard-stem Bulrush is a slow colonizer the preferred method for establishment is through placement of plugs. Early establishment of Hard-stem Bulrush and Giant Bur-reed propagules should offset some of the competitive advantage held by cattails in setting seed and colonizing available habitat.

Disturbance is a consideration in maintaining permanent marshes as well. Water levels will fluctuate less often in this system than in the seasonal habitats, and may be higher in the winter and early spring than in the summer and fall. Major floods will redistribute sediments and organic debris and impact wildlife populations. On a recurrence interval of 5-7 years, it may be necessary to drain this unit, probably in late July after most bird nesting is complete. This drawdown could be necessary to restore the desired interspersion of open water and vegetation and to manage invasive carp populations. On this drawdown schedule, the unit would be re-flooded in late August or early September.

Vegetation in the permanent marsh will be managed primarily by controlling water depths. Weeds are not likely to be a problem within the marsh due to flooding intolerance by invasive terrestrial weed species. It is generally assumed that Cattails, Bulrush, and Bur-Reed will eventually vegetate all areas where flooding is less than 0.91 m (3 feet) deep. Channels will be used to develop a mosaic interspersion of vegetation and open water. Generally this arrangement is more attractive to wildlife and facilitates penetration of the vegetation by Mosquitofish. An

additional design feature to increase habitat diversity and wildlife values will be to include one or more loafing/nesting islands and two areas of higher elevation to provide shallow water depths and function as seasonal wetlands during drawdown.

Although these methods are a "hands-on, active" form of management, it emulates historic conditions in the Beach/Stone Lakes basin. Tule marshes in this area dried out completely in late summer of drought years, and to some extent in every year, and then were exposed to grazing and wildfire. Disturbance factors will be developed in consultation with USFWS and/or CDFG on an as needed basis.

This habitat type will be included as a smaller element of the BLMB (i.e. approximately 21 acres). In part this is due to lower anticipated mitigation needs. More importantly, however, this type is more common in the Beach/Stone Lakes Basin than seasonal or forested wetlands. To develop a diverse complex of wetlands in this area, relatively less restored acreage is needed for this type. An additional consideration is that to encourage waterfowl nesting it is desirable to distribute permanent marshes in a wetland complex on about 10 percent of the total complex area. This allows optimal use of vegetation in uplands and drawndown seasonal wetlands (Strong, et. al., 1990).

3.1.3 Woody Riparian

A total of 25 acres of woody riparian habitat will be created at the BLMB. Three plant associations are proposed for the site: Mixed Riparian, Mixed Riparian/Oak Riparian, and Valley Oak Riparian (Hart, 1996). The proposed vegetation communities were determined by the baseline conditions at the site and the availability of these habitat types in nearby areas.

An important baseline consideration is the water permeability and water availability on the site during the critical summer season. Water availability tests conducted during the late summer of 1995 resulted in the development of three general zones of soil moisture conditions at the site. Zone 1 contained perched or free water above a depth of 0.91 m (36 inches) from the surface and is found in a narrow zone within 6.1-9.1 m (20-30 feet) from permanent water. Zone 2 has perched or free water at depths of 0.91-1.65 m (36-65 inches) and extends from 9.1 m (30 feet) to less than 30.5 m (100 feet) from the edge of the permanent wetland along the south portion of the BLMB. Zone 3 contains no free water within a depth of 1.65 m (65 inches) and is found at a distance of greater than 30.5 m (100 feet) from permanent water (Hart, 1996).

The planting palette and densities are:

		Number/Acre & Community		
Common Name	Scientific Name	MR[1]	MR/OR[2]	VOR[3]
Fremont's Cottonwood	*Populus fremontii*	100	40	-
Goodding's Willow	*Salix gooddingii*	75	-	-
Red Willow	*Salix laevigata*	25	-	-
Arroyo Willow	*Salix lasiolepis*	25	-	-
Box Elder	*Acer negundo*	50	110	-
Oregon Ash	*Fraxinus latifolia*	25	25	-
Valley Oak	*Quercus lobata*	-	100	250
Buttonbush	*Cephalanthus occidentalis*	20	20	-
California Wild Rose	*Rosa californica*	-	-	25
Blackberry	*Rubus ursinus*	20	20	25
Dogwood	*Cornus glabrata*	20	20	-
Hibiscus	*Hibiscus lasiocarpus*	20	-	-
Wild Grape	*Vitis californica*	20	20	25
Mugwort	*Artemisia douglasii*	20	20	25
Creeping Wildrye	*Leymus triticoides*	500	500	1000
Clustered Field Sedge	*Carex praegracilis*	500	500	-

[1] MR = Mixed Riparian Community
[2] MR/OR = Mixed Riparian/Oak Riparian Community
[3] VOR = Valley Oak Riparian Community

In wetter locations, Common Buttonbush is an important component. Smaller willows (e.g. Arroyo Willow and Northwest Willow) are present in the understory. Elderberry is also present in small numbers. The Common Buttonbush, smaller willows, and Elderberry may also be included as smaller components of the riparian habitat.

This habitat type will be located on Egbert and Clear Lake soils which are periodically flooded. Some landscape modifications are needed here because site hydrology has been substantially

altered. Historically, these riparian habitats were flooded for longer duration than remaining forests are now flooded. To emulate this condition during plant establishment, low dikes (approximately 0.30 m (1 foot) tall) will be used to extend flooding and soil saturation from natural winter hydrologic patterns. Water control structures may be used to flood these areas artificially in some years to either extend the period of soil saturation or to irrigate this habitat during extended drought periods. Flooding can also provide a means of controlling weed species competing against seedling establishment as well as eliminating or reducing the population of rodents that will feed on the young seedlings. The presence of a shallow water table in these areas will also encourage faster growth and greater seedling survivability. To prevent this technique from creating mosquito vector problems, these management units will not be flooded in the summer.

4.0 DESIGN CRITERIA

4.1 GRADING AND EARTHWORK

Extensive landscape modifications will be required. Seasonal and permanent freshwater marsh habitats will be located on Dierrsen and Clear Lake soils. Soils are to be removed to a depth of 1.22 m (4 feet) MSL throughout the restored wetland and riparian portions of the site. This will put the marsh bottom in close proximity to the duripan, reducing water requirements, and place the riparian plantings closer to the water table. This will also increase the frequency and duration of inundation from natural flood events.

The City of Sacramento removed approximately 152,920 m^3 (200,000 cubic yards) of soil from the BLMB site in November 1992 and spring/summer 1993. The earthwork will be balanced to leave enough soil at the levee and embankment locations for completion of these structures. Additional grading work may be required after the City of Sacramento has completed their soil removal. Topsoil from the site will be spread along the bottom of the seasonal wetlands to provide a vegetation seedbank. One of the seasonal wetland units is sloped with a maximum of 1.5 foot gradient between the inlet and outlet. This will result in different water depths within the unit (deeper at the outlet and shallower at the inlet) and will provide a changing shoreline during drawdown.

All construction work is prohibited in the archeological site (CA-SAC-327) and no soil will be placed on the site. Construction work will also be prohibited on CA-SAC-84 if a verified archeological site is found on Caltrans property.

4.2 WATER MANAGEMENT

Levees are designed with 3:1 slopes (or greater). Where vehicle access is necessary, levees are gravelled. Only one levee structure in the interior of the site will be constructed with vehicle access. Narrower dikes are used between management units where vehicle access is not necessary.

Beach Lake provides a water source for the project. The State Water Resources Control Board has issued a permit to appropriate water from Beach Lake. A groundwater pump is also provided as a secondary source of water in emergency situations.

Water levels in seasonal and permanent marshes will be regulated using alfalfa valves and flashboard structures (Figure 8) attached to 0.61 m (24 inch) diameter corrugated metal pipe. These structures are inexpensive, durable, and provide the greatest flexibility in regulating water levels. Flashboard structures will be constructed through levees at the wetland outlet locations. Water control structures use alfalfa valves as water intake devices into the wetlands.

Water depths within the wetland areas will be managed in a generally shallow depth regime during the first two years of operation. In particular, the first year is critical for plant establishment because the new plants lack extensive root, stem, and leaf systems with aerenchyema channels to transport oxygen to the roots. As a consequence, prolonged deep inundation results in stress to wetland species often culminating in decreased vigor and even death of the plants (Hammer, 1992). After establishment of good root and leaf growth, water levels can be increased without adversely impacting the wetland plants. However, this does not take into consideration unpredictable natural flooding events.

The initial first year flooding of the seasonal and permanent wetlands should be implemented by beginning with a moist soil impoundment strategy. Using this method, the wetlands will receive enough water to saturate the soils and thereby germinate seeds of wetland plants, but not enough to result in inundation of the young plants. After germination and growth, water levels can be gradually increased to a maximum average depth of 0.15 m (six inches) in the seasonal wetlands and 0.30 m (one foot) in the permanent wetland. The average 0.15 m (six inch) water depth in the seasonal wetlands will benefit annual wetland grass species and the 0.30 m (one foot) depth in the permanent wetland will encourage growth of perennial permanent marsh species.

An initial water management strategy for the first two years is proposed for the seasonal and permanent wetlands at the BLMB. Evaluation of wetland performance during these two years will determine the strategy to be pursued during year 3. The seasonal wetlands have an eventual maximum water depth of 0.46 m (1.5 feet) and the permanent wetland an eventual maximum water depth of 0.91 m (3.0 feet).

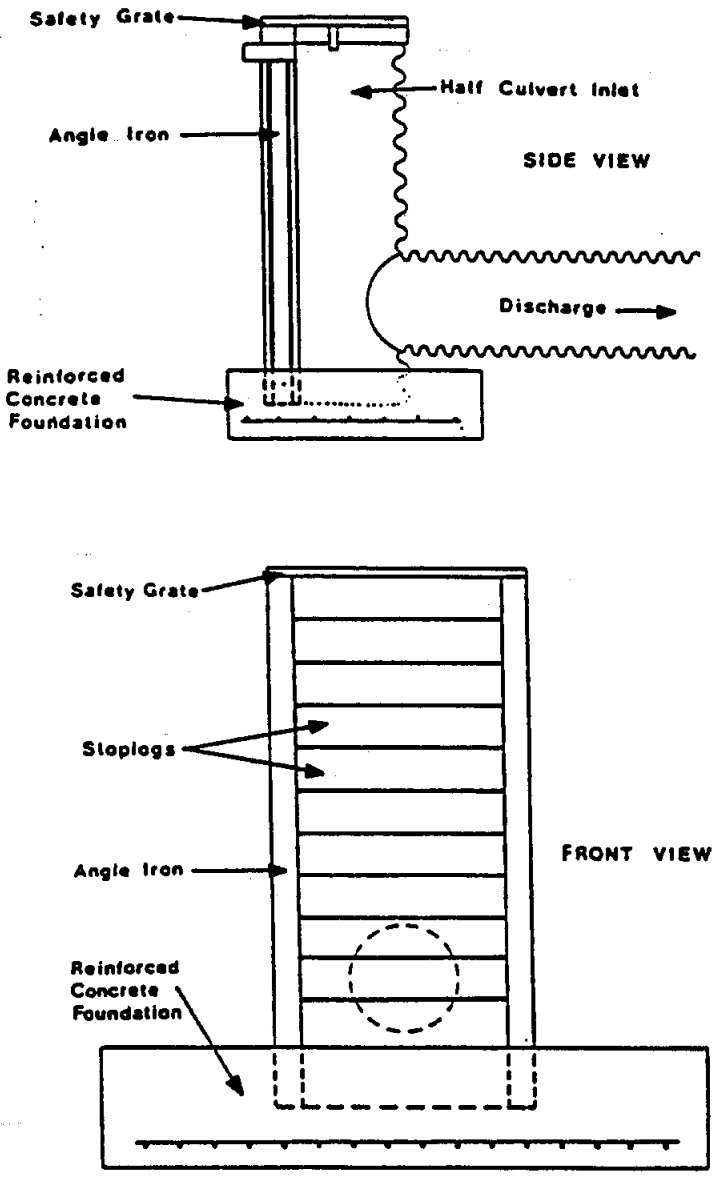


Figure 8. Example of Typical Flashboard Structure.

The following is a proposed water management strategy for the first two years of operation of the BLMB:

Wetland Unit	Year	Initial Flooding	Maximum Ave Depth	Begin Drawdown	Time of Drawdown
Seasonal Unit 1	1 2	Sept. 1 Oct. 1	6-in 1-ft	Mar. 30 Mar. 30	2 wk 2 wk
Seasonal Unit 2	1 2	Sept. 1 Nov. 1	6-in 1.5-ft	Apr. 15 Apr. 15	2 wk 2 wk
Permanent Wetland	1 2	Sept. 1 ---	1-ft 3-ft	--- ---	--- ---

4.3 PLANT ESTABLISHMENT

In addition to active plant establishment work described in the following sections, the success of this project depends in part on natural recruitment. Initially, recruitment will be most important in the seasonal wetlands, however, the long-term success of all these habitats depends upon providing appropriate hydrology and soil conditions which facilitate regeneration.

In all habitats, monitoring will be necessary to determine which plants are flourishing and which ones are not. Re-planting efforts will be based upon the results of monitoring. A dead plant of one species will be replaced by a different species if monitoring indicates that site conditions are not appropriate for the first species.

4.3.1 Seasonal Marsh

Target species for these components are already present in adjacent habitats. These species are prolific seed producers and good colonizers of available habitat and many are considered to be agricultural weeds. Annual seed production, use of water from existing wetlands, flood events, and seeds carried by animals would ensure that the seed bank is adequate in future years. The seasonal wetlands will be inoculated with topsoil from the site during construction. The topsoil containing the local seed bank should be adequate for initial establishment of plants in the seasonal wetlands.

Irrigation will be accomplished by flooding units as described previously. Seed germination and the resulting vegetation is largely dependent upon timing and rate of drawdown in the spring. Late drawdowns, for example, favor Bearded Sprangletop and Creeping Spikerush. Early drawdowns favor annual Smartweeds. Both strategies are suitable for Barnyard Grass

(Fredrickson and Taylor, 1982). Invasive terrestrial weeds can be controlled primarily by water level manipulations.

4.3.2 Permanent Marsh

Establishment of vegetation in the freshwater marsh will require more effort than the seasonal marsh, because target species in this wetland are perennials.

Hard-stem Bulrush and Giant Bur-reed are the preferred dominant species for this habitat. Plantings of Bulrush and Bur-reed rootstocks/rhizomes and seeds will be accomplished prior to flooding the habitat. A source for the rootstocks/rhizomes has not yet been established. Narrow-leaf Cattail and Broad-leaf Cattail will become established through natural recruitment where the water depths are less than 0.91 m (3 feet).

Minor but desirable components of the freshwater marsh will be Sanford's Sagittaria and California Hibiscus. These species are rare, but present in the Beach/Stone Lakes Basin. This project offers potential habitat which could improve long-term viability of the species. Terrestrial weeds will not be a significant problem in this habitat.

4.3.3 Woody Riparian

Restoration of riparian forest will require more intensive planting and maintenance than the marsh habitats. Target species will be planted on Egbert and Clear Lake soils. Planting stock will preferentially be from the Beach/Stone Lakes Basin if available. A combination of seedlings and cuttings may be used for planting stock. Riparian plantings are expected to occur during the late winter or spring following construction of the wetlands.

Periodic flood irrigation may be provided as weather conditions necessitate. Depending upon root development relative to the water table, irrigation may be extended beyond the first and second years until roots reach the water table. Flood irrigation is also an effective method of weed control if waters are retained for a sufficient period of time and will be preferentially employed.

4.4 WATER RIGHTS

Caltrans possesses Riparian Water Rights from Beach Lake by reason of ownership abutting Beach Lake. This right provides Caltrans with the ability to direct divert waters from Beach Lake for beneficial uses which could include public trust use such as wildlife habitat. Storage of these waters on site, such as in permanent and seasonal marshes, requires an Appropriative Right which was received in 1996.

During May 1992, Caltrans submitted an "Application to Appropriate Water by Permit" for

processing by the State Water Resources Control Board (SWRCB). This application proposed to divert up to 579 acre feet of water annually from Beach Lake for purposes of Fish and Wildlife Preservation and/or Enhancement. The application requested a direct diversion rate of 1.5 cubic feet per second from May 1 to September 30 to offset seepage and evaporative losses and to provide water circulation after the initial filling of the project. The application further requested 121.5 acre feet by storage from October 1 to April 30 for the initial filling of the wetlands. A permit was issued in 1996 granting the requested amounts.

4.5 ACCESS

Access for maintenance and monitoring will be provided. The access road currently existing along the western boundary of the BLMB where a utility easement now runs will be retained. Access into the interior of the site (to manipulate the alfalfa valves) will be necessary but will be restricted as much as possible. A locked gate is established at the entrance road to prevent unauthorized access. Public access to the parcel is restricted.

4.6 RECREATIONAL USE

Non-consumptive recreational use of portions of the BLMB may be permitted in conjunction with interpretive facilities associated with the Stone Lakes National Wildlife Refuge. A visitor center is currently proposed for the property north of Morrison Creek. Ultimately, however, this facility may be placed in another portion of the refuge.

A number of design and management options exist to mitigate impacts of recreational use. Some of these include:

- Allow recreational access only on existing roads necessary for maintenance and management activities.
- Use design elements such as deep water and thickets of thorny vegetation (e.g. Blackberry and California Wild Rose) to prevent uncontrolled use.
- Include riparian forest as a visual barrier to reduce disturbance of wildlife on marshes.
- Restrict visitor use during critical periods, particularly when wintering birds are present, to 3 days a week.
- Prohibit recreational use of the site or allow only supervised use of the site for educational purposes.

4.7 HABITAT ENHANCEMENT TECHNIQUES

4.7.1 Embankment/Oak Woodland

Excess earthen material from site modifications was placed parallel to Interstate 5 immediately west of the right of way fence. This embankment runs from south of the Morrison Creek bridge

to the slough on the south edge of the BLMB and crests at 28' MSL.

One function of the embankment is to attenuate noise levels from traffic on Interstate 5. Noise measurements made by Caltrans engineering staff indicate that receptors 24.38 m (80 feet) from the freeway right-of-way fence experience noise levels of 65 decibels (db). Receptors at 158.50 m (520 feet) from the fence had a measured value of 49 db. This second value is substantially lower than predicted by computer models. For reference, 70 db is equivalent to a power mower at a distance of 21.34 m (70 feet), 60 db is equivalent to an air conditioner at 15.24 m (50 feet) and 50 db is equivalent to a quiet urban neighborhood in the daytime. An embankment with a crest at 28' MSL would reduce noise levels 4-5 db at the first receptor located just west of the berm. This reduction (to about 61 db) would be a noticeable difference.

SUBJECTIVE REACTION TO CHANGES IN
NOISE LEVELS OF SIMILAR SOURCES

CHANGE IN LEVEL (db)	SUBJECTIVE REACTION
1	Imperceptible
3	Just barely noticeable
6	Clearly noticeable
10	About twice (or half) as loud

Further away, near the second receptor, the change, if any, would not be noticeable. Sound barriers have a shadow effect which reduces noise levels for receptors close to the barrier but provide negligible benefits further away. There are no data which demonstrate that the noise reductions provided by an embankment on this project would have any beneficial effect on wildlife habitat values. Intuitively, many wildlife biologists feel that less noise does have beneficial effects.

Other factors which substantially affect noise levels include topography and wind. Prevailing winds from the southwest reduce freeway noise levels at the BLMB.

This embankment serves several other habitat enhancement functions. During major floods it provides flood refugia for terrestrial wildlife. Artificial burrows for Burrowing Owls (*Athene cunicularia*) have been included on the west side of the embankment. The embankment may also reduce vehicle collisions with low-flying birds since birds would be forced to fly higher to negotiate the embankment.

4.7.2 Enhancement of Existing Habitats

The BLMB includes two existing wetland areas. The slough on the southern edge of the property was recently converted from seasonal to permanent freshwater marsh by restoration activities on the adjacent private parcel. Channels could be excavated into adjoining higher ground to create islands. This would reduce predation on loafing and nesting birds by raccoons and other predators.

Nesting opportunities for wood ducks can be improved by placing nest boxes within the permanent marsh habitat along the southern boundary and also in Beach Lake. Riparian areas could also have wood duck nesting boxes installed.

As recently as 1991, a large colony of Brazilian Free-tailed Bats were present just northwest of Beach Lake. This colony was prevented from roosting in 1992 when netting was placed over their colony roosting site (railroad trusses). These bats may be encouraged to remain in the Beach Lake area by the installation of bat roost boxes in the riparian areas at the BLMB.

The proposed conversion of agricultural lands typically planted to safflower and corn, or left fallow and disced, to seasonal wetlands should substantially improve foraging quality for Swainson's Hawks. Preferred prey species, especially California Meadow Vole, are currently found in very low numbers in the limited seasonal wetland habitats on the margins of the property (Wyatt, et al., 1991). Numbers of California Meadow Vole should increase substantially with the proposed project.

Restoration of forested wetland on the BLMB property will enhance similar adjacent habitats by increasing size of the habitat patches. Existing forested wetland is too limited in extent to provide habitat for some riparian species (e.g. Western Yellow-billed Cuckoo). Larger habitat patches increase the likelihood that habitat needs can be met for riparian species.

4.8 MOSQUITO ABATEMENT AND MANAGEMENT

Wetland habitats have the potential to generate significant numbers of mosquitos. Key considerations in preventing mosquito populations from exceeding nuisance thresholds include designing the project to allow adequate monitoring, inclusion of control structures to quickly change water levels (or drain the problem unit), manage the wetland to encourage establishment of predator species, and provide for the use of pesticides when vector emergencies do occur. Specific measures intended to control mosquitos include the following:

- Seasonal and permanent marshes will have independent water control structures for manipulating water levels to control severe Mosquito production.
- Seasonal wetlands will be drawn down in the spring and will generally not be ponded in the summer. Occasional flood irrigation may be used during summer months to germinate annual

plant species. When irrigated, control structures will be used to drain waters from the site before emergence of adult mosquitos.

- After seasonal wetlands are flooded in the fall or early winter, they will remain ponded through the winter, to encourage the establishment of mosquito predators, until drawn down or drained in the spring.
- Access levees will be wide enough to provide access for monitoring, stocking of mosquitofish, or application of pesticides.
- Water depths in the permanent marsh will be maintained at > 0.15 m (6 inches) during summer to support Mosquitofish.
- Open water areas and channels could be maintained in the permanent marsh to sustain populations of Mosquito predators throughout the unit.
- Because of potential effects on non-target species, the use of pesticides at the BLMB is not the preferred mode of mosquito control and will only be used when all other measures have failed. When natural predators and manipulation of water levels are not adequate to prevent mosquito populations from exceeding nuisance thresholds, pesticides will be used. Preference will be given to applications of *Bacillus thuringiensis* var. *israelensis* before nuisance thresholds are reached. Only when absolutely necessary will other chemicals be used. Methoprene, a growth regulator, would be the most likely choice for application. Use of these pesticide measures will be coordinated with the Caltrans Office of Environmental Management, Sacramento. It will be Caltrans' (or Caltrans' designee's) responsibility to coordinate regarding the use of pesticides with the signatory agencies to the Agreement on Mitigation Strategy.

5.0 OPERATIONAL ISSUES

5.1 MONITORING

Monitoring will be phased into two components. One component will document progress toward attainment of specific performance criteria for each habitat type (i.e. seasonal marsh, permanent marsh, and woody riparian) for calculation of mitigation ratios. Success criteria have not been finalized at this time. A community-based habitat evaluation procedures (HEP) method will be utilized to ascertain the performance of the restored habitats for the mitigation ratios. The formal performance determinations using this methodology (community-based HEP) will take place when habitats have become established and Caltrans wishes to reduce the mitigation ratios.

The other component of monitoring will be an ongoing program to document habitat values at the BLMB. Documentation of habitat values will be necessary to assure resource and regulatory agencies that the BLMB provides credits against which future highway impacts can be debited. Annual reports documenting site conditions and trends will be prepared by Caltrans and submitted to coordinating agencies.

5.2 MANAGEMENT

The day to day management of the BLMB will be the responsibility of Caltrans or Caltrans' designee during the duration of Caltrans' use of the BLMB. This work will mainly consist of operation and maintenance of water control structures. Long term management may also include vegetation management activities in coordination with USFWS and/or CDFG.

5.3 OWNERSHIP

At this time, it is expected that Caltrans will retain ownership of the BLMB property until exhaustion of mitigation credits. However, the Refuge Unit of the U.S. Fish and Wildlife Service has expressed interest in conducting the day-to-day management of BLMB and in acquiring title to the site. Since the BLMB is located within the core area of the Stone Lakes National Wildlife Refuge, the U.S. Fish and Wildlife Service would be the most appropriate trustee agency for the BLMB. Caltrans and the USFWS will be discussing the appropriate role for the USFWS at BLMB. Any transfer of ownership would require concurrence by signatory agencies to the Agreement on Mitigation Strategy. Alterations in management responsibilities or ownership will require coordination with and approval of the signatory agencies to the Agreement on Mitigation Strategy.

6.0 DEFINITIONS

CEQA - The California Environmental Quality Act, California Public Resources Code Sections 21000 et seq.

DIKE - A bank, usually earthen, constructed to control or confine water.

EASEMENT - A right, such as a right of way, afforded to make limited use of another's real property.

ENCUMBERANCE - A claim upon property.

ENDANGERED SPECIES - A plant or animal species or subspecies whose survival is threatened with extinction and is included in the federal and/or state lists of endangered species.

ENHANCEMENT - Actions intended to improve plant diversity or wildlife values of existing habitats but leave the community substantially "as is".

FACULTATIVE WETLAND PLANTS - Plants that occur usually (estimated probability >67% to 99%) in wetlands, but also occur (estimated probability 1% to 33% in nonwetlands).

HABITAT - The natural environment of an organism; the place where it typically is found.

HYDRIC SOILS - Soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation

HYDROPHYTIC VEGETATION - The sum total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present.

MEAN SEA LEVEL (MSL) - A datum, or "plane of zero elevation", established by averaging all stages of oceanic tides over a 19-year tidal cycle or "epoch". This plane is corrected for curvature of the earth and is the standard reference for elevations on the earth's surface.

MITIGATION - The lessening of project impacts by avoidance, minimizing impacts, rectifying the impact, reducing or eliminating the impact over time, or compensating for the impact.

MITIGATION CREDIT - A unit of measured area supporting wetland habitat and wetland habitat values not preexisting at the mitigation bank site prior to bank development.

MITIGATION DEBIT - An amount subtracted from the overall available mitigation credit total to compensate for unavoidable transportation project impacts.

NEPA - The National Environmental Policy Act (42 U.S.C. 4321 et seq.).

OBLIGATE WETLAND PLANTS - Plants that occur almost always (estimated probability >99%) in wetlands under natural conditions, but which may also occur rarely (estimated probability <1%) in nonwetlands.

PERMANENT WETLAND - Permanent soil inundation or saturation by surface water or groundwater resulting in a prevalence of vegetation adapted for life in saturated soil conditions.

PRACTICABLE - Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

PROJECT - Any Caltrans action that has potential effects on the environment.

RESTORATION - The conversion of lands currently being farmed or fallow lands to habitats intended to resemble historic natural plant communities.

RIPARIAN HABITAT - Woody vegetation (trees and shrubs) that grows in soils saturated for a substantial portion of the year, especially on the edges of open water (lakes, riverbanks, ditches).

For purposes of this document, two classes of riparian habitat are addressed:

1. Forested - The wetland class characterized by woody vegetation that is 6 m (19.7 feet) or taller.
2. Scrub-shrub - The wetland class characterized by woody vegetation that is less than 6 m (19.7 feet) tall.

SEASONAL WETLANDS - Soil inundation or saturation by surface water or groundwater occurring periodically during the growing season of the prevalent vegetation, sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Although vernal pools are typically considered seasonal wetlands, for purposes of this document, vernal pools are considered seperately from the term seasonal wetlands.

THREATENED SPECIES - A plant or animal species or subspecies that is likely to become endangered in the foreseeable future and is included in the federal or state lists of threatened species.

VERNAL POOLS - Vernal pools are seasonally flooded landscape depressions that support a distinctive flora and fauna adapted to periodic or continuous inundation during the wet season. Vernal pools typically are dominated by annual plant species (e.g. *Downingia, Psilocarphus, Pogogyne*), but may also include some perennials (e.g. *Eryngium*). Seasonal wetlands with longer periods of wetland hydrology, dominated by species within the following generalist hydrophyte genera: *Juncus, Eleocharis, Scirpus, Polygonum, Cyperus, Carex*, and *Typha* would ordinarily be mitigable at the Beach Lake Mitigation Bank.

WETLANDS - Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

WETLAND HYDROLOGY - The area is inundated either permanently or periodically at mean water depths less than or equal to 2 m (6.6 feet), or the soil is saturated to the surface at some time during the growing season of the prevalent vegetation.

WETLAND MITIGATION BANK - A single contiguous parcel of land consisting of nonwetland habitat which has undergone those physical changes necessary to create and optimize the acreage and quality of wetland habitat on the site for the express purpose of providing mitigation credits to offset the adverse impacts to wetlands from approved projects elsewhere.

7.0 REFERENCES

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9.0 ACKNOWLEDGEMENTS

In addition to those listed as contributors, conversations with many experienced individuals influenced the preparation of this Restoration Plan. Foremost among these unofficial contributors are Steve Chainey (Jones and Stokes Associates); Andy Engilis, Fritz Reed, Robert Charney, and Jim Well (Ducks Unlimited); and Jeff Hart. Their contributions and criticisms are appreciated.

10.0 APPENDICES

10.1 AGREEMENT ON MITIGATION STRATEGY

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APPENDIX 10.1
Agreement on Mitigation Strategy

AGREEMENT ON MITIGATION STRATEGY
pertaining to
IMPLEMENTATION AND OPERATION OF
THE BEACH LAKE MITIGATION BANK

I. INTRODUCTION

The purpose of this document is to implement the terms of the Memorandum of Agreement (May 13, 1991) entered into by the California Department of Transportation, the Federal Highway Administration, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, and the California Department of Fish and Game recognizing the importance of early coordination and planning for mitigation of impacts to natural resources. The major goal of early coordination is to identify all opportunities to avoid and/or minimize impacts to valuable resources. A secondary goal is to increase the probability of successfully replacing unavoidable resource losses with high quality replacement habitat, and to realize the maximum benefits from the mitigation expenditure.

Planning for and providing compensation in advance for unavoidable losses from transportation impacts is one approach to minimize the adverse impacts from lost habitat. Advance compensation affords several advantages over the customary method, including: 1) it generally involves a more effective planning effort, often allowing integration into larger efforts that are consistent with and add to regional preservation goals and objectives; 2) the less restrictive time constraints offer the opportunity to evaluate and select the more suitable sites and conditions; 3) advance compensation may reduce temporal losses of wetland functional values; 4) it creates a cooperative atmosphere resulting in more amicable negotiations and early resolution of conflicts; and 5) it may minimize project delays.

The technique of mitigation banking is a method of providing advance compensation for similar impacts from several future projects in a consolidated effort. The additional advantages of a banking approach are: 1) compensation for small losses that otherwise may not be fully or successfully replaced; 2) the consolidation of piecemeal efforts increases management options and larger habitats often provide greater benefits as well as offer greater long-term protection; 3) economies of scale in both creation and maintenance; 4) easier monitoring and evaluation; and 5) public awareness of the habitat restoration can increase the incentive for additional public and private efforts.

II. PURPOSE

The California Department of Transportation (Caltrans) in cooperation with the Federal Highway Administration has proposed

creation of the Beach Lake Mitigation Bank (hereafter referred to as the Bank) on Caltrans property in Sacramento County, south of the City of Freeport. This Agreement on Mitigation Strategy outlines the intention, conditions, and procedures under which Caltrans will restore to high quality habitat a 142 acre parcel at Beach Lake, for the purpose of receiving compensation credit for unavoidable losses to wetland and sensitive upland resources from future transportation projects. The Bank will primarily provide freshwater wetland and woody riparian habitats, but will also create upland components by design (e.g. oak woodland). The needs of endangered species associated with these habitat types will be an important consideration in the design of restored habitats.

Implementation of the bank will facilitate compliance with Executive Order 11990 (Protection of Wetlands), the Clean Water Act (33 USC, 1344), Fish and Wildlife Coordination Act (16 USC, 661-667), and the Federal and California Endangered Species Acts by providing high value replacement habitat for unavoidable impacts associated with Caltrans activities while maximizing benefits to the natural environment. Although it is recognized that off-site mitigation is not the preferred option, it is also recognized that on-site habitat restoration, at times, is impossible to accomplish, can come with such ecological risks that successful mitigation cannot be assured, or can only be accomplished at impracticable cost. Because the Bank is being developed in conjunction with a multi-agency project to restore, enhance, and protect a large tract of wildlife habitat known as the Stone Lakes National Wildlife Refuge, its individual habitat values will be amplified and significantly contribute to regional habitat preservation goals. The Bank will be particularly practical for those projects with minor individual, but substantial cumulative impacts, which is often the case with improvements/modifications to existing transportation facilities. Inter-agency mitigation coordination will be simplified because the bank will provide functioning, high quality habitat in advance of an impact, which can be better evaluated and more easily agreed upon than a paper plan.

This agreement establishes a classification scheme for the habitats that will be the units of exchange in the banking process. It provides the conditions under which the bank can be used for compensation of project impacts. It outlines a methodology for evaluating habitat values for both impacted resources and the bank's replacement resources. It develops the framework for tracking the debiting and crediting of banking transactions. It institutes the standards for maintaining, monitoring, and the long-term management of the bank.

III. GUIDELINES AND POLICIES

The implementation, use, operation and maintenance of the Bank shall be consistent with the following guidelines and/or policy statements

- *Memorandum of Agreement on Early Mitigation Planning for Transportation Improvements in California (1991)*
- *Presidential Executive Order 11990 (1987)*
- *Applying the Section 404 Permit Process to Federal-Aid Highway Projects*
- *U.S. Fish and Wildlife Service Mitigation Policy (January 23, 1981)*
- *Mitigation Banking Guidance U.S. Environmental Protection Agency Region IX (December 20, 1991)*
- *EPA/ACOE MOA Concerning Determination of Mitigation Under the Clean Water Act Section 404(b)(1) Guidelines (February 6, 1990)*
- *Senate Concurrent Resolution 17 for the protection of oak woodlands in California (1989)*
- *Memorandum of Understanding Between the California Department of Transportation and the U.S. Fish and Wildlife Service (1988)*
- *Memorandum of Understanding Between the Department of Transportation and the Department of Fish and Game Regarding Construction of Transportation Facilities and Protection of Fish and Wildlife Resources (1979)*
- *U.S. Fish and Wildlife Service Guidance on Mitigation Banking (1983 and 1988)*

IV. APPLICABLE ECOREGION

The Bank is established to off-set appropriate habitat impacts from transportation projects in the lower Sacramento Valley and upper San Joaquin Valley. The geographic area, subject to restrictions in Sections V, VI, and VII, is indicated on the map in Attachment A. In general, habitat losses from projects below the 1500 foot elevation in the following counties can be compensated for in the bank:

Amador	Calaveras	Colusa
El Dorado	Nevada	Placer
Sacramento	San Joaquin	Solano
Stanislaus	Sutter	Tuolumne
Yolo	Yuba.	

V. CRITERIA FOR UTILIZING THE BANK

Use of the Bank will be deemed appropriate for compensation of habitat impacts when the following criteria have been met:

- *All practicable measures to avoid and minimize resource loss have been incorporated into the project design;*
- *A delineation of wetlands subject to jurisdiction under Section 404 of the Clean Water Act has been verified by the U.S. Army Corps of Engineers;*

- *Signatory agencies have agreed that total on-site replacement is not practicable, is inappropriate, or not in the best interest of the long-term protection and maintenance of the resource;*
- *The impact is within the defined ecoregion, unless an unusual situation exists and use of the bank is agreed to as the most appropriate action by the signatory agencies;*
- *The habitat being lost must fit one of the defined habitat classes within the bank and having sufficient credit. However, in agreed upon situations a relatively scarce or threatened resource may be substituted as compensation for an abundant one being lost. Out-of-kind mitigation must be agreed upon by all the signatory agencies;*
- *An evaluation of the impacted habitat's values has been accepted by the resource agencies;*
- *Functions other than wildlife habitat are adequately compensated for, either within the Bank or by other environmentally acceptable means.*

VI. APPROPRIATE HABITAT TYPES

The primary function of the Bank is to provide replacement habitat for losses to freshwater, valley wetlands (excluding vernal pools). Regulatory wetlands identified as freshwater wetlands (seasonal and/or permanent) or woody riparian (scrub-shrub and/or forested) will be mitigable at the Bank.

Design of the Bank will also create upland habitats (e.g. valley oak woodland, native grassland, elderberry savannah) to act as wildlife refugia and buffer areas, and may be used in combination with the wetland habitat, or alone, as appropriate mitigation.

As an ancillary benefit to the creation and restoration of wetland and sensitive upland habitat, the Bank design provides suitable conditions for several State and/or Federal candidate, rare, threatened, and endangered species. As provided for in Section VIII, acreage credited as wetland or upland may also be credited as acreage for endangered species mitigation as appropriate, and if agreed to by the federal and state endangered species offices.

VII. EVALUATION METHOD

The restoration goal of the Bank is to provide a high quality complex of habitats which complement each other and promote diversity and stability. Due to the linear nature of transportation projects, the Bank will primarily be used to compensate for small losses of wetland habitats (usually 1 acre or less, but with an upper maximum of <10 acres) generally already isolated or fragmented with only low to moderate functional values.

Attempting to create numerous distinct and highly specific habitat sub-classes would decrease the likelihood of success, reduce habitat values as each component would necessarily be smaller, not be consistent with current wetland restoration theory and goals, and be extremely expensive. Therefore, it is recognized that in many cases the replacement habitat may not precisely mimic the lost habitat (in-kind), but resemble historic wetlands and aquatic habitats of the Sacramento Valley. To accommodate these variations in specific community composition of the lost habitat and the replacement habitat, the exchange will be made using the following classification system:

1) Freshwater Wetland - seasonal
2) Freshwater Wetland - permanent
3) Woody Riparian - forested
4) Woody Riparian - scrub/shrub
5) Valley Oak Woodland

Each of these habitat categories have acreage goals and community composition goals as established in the Beach Lake Mitigation Bank Restoration Plan (Attachment B). Target acreages were based upon anticipated mitigation needs, estimates of minimum viable habitat sizes, desirable community complexity and stability, and other practical considerations. In addition, there will be associated upland habitat types which will increase habitat values of the wetland as well as the site as a whole and the Stone Lakes National Wildlife Refuge.

Extensive habitat evaluations by Caltrans will occur annually for at least the first five years of establishment of the Bank. Minimum mandatory evaluation criteria may include the following parameters:

Freshwater Wetland - Seasonal and Permanent
- 1) Species Composition
- 2) Relative Cover
- 3) Vegetation/Open Water Distribution
- 4) Vegetation Vitality
- 5) Hydrologic Monitoring

Woody Riparian
- 1) Species Composition
- 2) Stem Density
- 3) Absolute Cover
- 4) Vegetation Height
- 5) Vegetation Vitality

Wildlife Surveys
- 1) Species Composition

An On-going Monitoring program and a Performance Evaluation program will be implemented for monitoring of the site. Caltrans will prepare a detailed draft Monitoring Plan by November 15, 1993 discussing details of both aspects of monitoring (Performance Evaluation and On-going Monitoring). The other signatory agencies

will review and provide comments on the Monitoring Plan by December 15, 1993, and a final plan shall be produced by February 15, 1994.

Impacted habitat will be evaluated during the environmental assessment process for each project alternative, and classified as seasonal or permanent wetland, or woody riparian. A Caltrans biologist will perform the evaluation and request concurrence from the signatory agencies. Upon request by any of the agencies, an interagency evaluation team will be formed to perform the evaluation.

Compensation habitat evaluations will be reported annually and either the last regular report, or by request a special evaluation, will be used for credit exchange. A pre-restoration evaluation of the site will be used as the baseline for calculating initial available credits.

VIII. DEBIT AND CREDITING PROCEDURES

The Chief, Environmental Branch "C" of Caltrans District 3 will serve as the Bank manager and will perform all duties necessary to maintain the bank account, and all other required records and reports. It will be his/her responsibility to inform representatives from the other signatory agencies, at the earliest opportunity, whenever Caltrans is developing a project which may have habitat impacts that fit the criteria of this agreement and compensation at the Bank may be considered.

Agreement by signatory agencies to utilize the Bank as compensation for specific habitat losses from a project will occur during the CEQA/NEPA process and its documentation. All signatory agencies will be notified by Caltrans when use of the mitigation bank is proposed. Actual debiting of the bank account will take place after the project has final design approval and the appropriate permits, but prior to any activity which could adversely impact the existing habitat values. The bank manager will maintain a running account of all pending debit actions to ensure adequate habitat credits are available before the bank is considered for a new project. The bank manager will send action notices to each agency after each change in balance, credit, or debit.

The "currency of exchange" will be area as measured in acre units. For the three basic habitat types, debits will be made at a 3:1 ratio for woody riparian and 2:1 ratio for freshwater wetland until performance criteria are met. Thereafter, debits will be at a 1:1 ratio as long as the bank habitat continues to meet performance standards. Once a block of habitat credit has been used at its current value, it is no longer eligible to receive additional credit value in the bank account as it matures. Credits will not be available for exchange until conclusion of construction of the mitigation bank.

Debits will not be against any specific plot within the Bank. Instead, debits will be against the total acreage of the habitat category. A running tally of acreage previously debited and credit remaining will be maintained. Out of category exchanges can only be made with the consent of all signatory agencies.

If performance standards have not been met, it may be necessary for an interagency team to re-evaluate management activities, site design, or performance standards for modification or adjustment and for Caltrans to implement remedial actions to correct problems or inadequacies. Debiting from the Bank will cease if habitat values indicate a failure of the restoration effort. Caltrans will be held responsible for remediation or implementation of new mitigation to replace project mitigation credits already used at the mitigation bank in the event of mitigation failure.

The Bank has been designed to provide high quality resources with a wide range of values and functions important to the natural landscape of the Central Valley. Although primarily established to provide wetland habitat values, it is expected that the bank as a whole will provide additional values above those required for project wetland impacts. Therefore, it is agreed that the Bank units may provide credit for other impacted resources (such as Swainson's Hawk foraging habitat). Caltrans may request that specific additional credit be granted for a previously unspecified resource value. Use of mitigation bank credits for other resource values will be determined by an interagency evaluation and approved by the signatory agencies.

IX. MONITORING

Two components of monitoring will be implemented. One component will document progress toward attainment of specific performance criteria for each habitat type for calculation of mitigation ratios. Performance standards will be based upon community-based habitat evaluation procedures (HEP). The community-based HEP will be used to evaluate habitat values at the Bank for the reduction of mitigation ratios. Reduction in mitigation ratios would be based upon achievement of habitat value goals. As these goals are met, mitigation ratios at the Bank would be reduced. The formal performance determinations using community-based HEP will take place when habitats have become established and Caltrans wishes to reduce the mitigation ratios.

The other component of monitoring will be an ongoing program to document habitat values at the Bank. An informal evaluation using community-based HEP may be regularly used as part of the ongoing monitoring evaluations to be implemented for this project. Annual reports documenting site conditions and trends will be prepared and submitted to interested agencies. Extensive habitat evaluation reports will be completed annually by Caltrans for at least the first five years following bank establishment and submitted to each

signatory agency. This report will be used as the evaluation of compensation habitat for exchange until the next monitoring examination or a special evaluation is performed.

Thereafter, Caltrans will continue an informal monitoring program (every other year) to ensure the bank continues to adequately function and provide the required habitat values. A letter will be filed with each agency once a year indicating the bank is adequately functioning and properly maintained and would detail any remedial actions taken during the year.

Upon reasonable notice, any signatory agency can participate in a monitoring survey, or a formal field review. If there is disagreement on the adequacy of the performance, existing values, or the management program, any party may request an interagency evaluation. If determined to be appropriate by the signatory agencies, adjustments or operational changes will be implemented.

X. MANAGEMENT

Caltrans is responsible for ensuring that the bank will be maintained as a high quality natural resource and meet all obligations and commitments of this agreement and those contained in mitigation agreements for which the bank is providing replacement habitat values, during the period in which it exercises control. Caltrans may contract for maintenance and operation with a third party acceptable to the other signatory agencies. Caltrans will provide a funding mechanism to pay for future operation and maintenance of the mitigation bank.

Caltrans, acknowledging its fundamental role as a transportation planning organization and not a natural resource trustee, intends for the U.S. Fish and Wildlife Service (Stone Lakes National Wildlife Refuge) to take eventual ownership and/or conservancy of the bank in perpetuity. The long-term operation and maintenance funding mechanism will be provided to the conservator (U.S. Fish and Wildlife Service) for maintenance of the site in perpetuity. The conservator will adhere to provisions of the Restoration Plan and this Agreement on Mitigation Strategy. Deed restrictions would be implemented upon transfer of the Bank to ensure adherence to the Plan and Agreement. The conservator will be approved by all signatory agencies. When transfer of control and management responsibility of the bank to the U.S. Fish and Wildlife Service has been concluded, Caltrans' long term preservation obligation will be transferred. Caltrans may retain certain responsibilities and/or obligations until exhaustion or relinquishment of any remaining habitat credits and until completion of habitat monitoring requirements.

XI. DEFINITIONS

ACRE-UNIT - A unit of measured area expressed as acreages supporting wetland or riparian habitat and wetland or riparian habitat values not preexisting at the mitigation bank site prior to bank development. Acre-units are used for the mitigation bank accounting processes.

CEQA - The California Environmental Quality Act, California Public Resources Code Sections 21000 et seq.

ENDANGERED SPECIES - Federal definition: An endangered species is any species designated as being in danger of extinction throughout all or a significant portion of its range, excluding insects determined by the Secretary to be pests (16 USC 1532, 50 CFR 424.02). State definition: An endangered species is a native species or subspecies of bird, mammal, fish, amphibian, reptile, or plant that is in serious danger of becoming extinct throughout all or a significant portion of its range (Fish and Game Code Sec. 2062).

HABITAT - The natural environment of an organism; the place where it typically is found.

HYDRIC SOILS - Soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation

HYDROPHYTIC VEGETATION - The sum total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present.

MITIGATION - The lessening of project impacts by avoidance, minimizing impacts, rectifying the impact, reducing or eliminating the impact over time, or compensating for the impact.

MITIGATION CREDIT - A unit of measured area supporting wetland or riparian habitat and wetland or riparian habitat values not preexisting at the mitigation bank site prior to bank development.

MITIGATION DEBIT - An amount subtracted from the overall available mitigation credit total to compensate for unavoidable transportation project impacts.

NEPA - The National Environmental Policy Act (42 U.S.C. 4321 et seq.).

PERMANENT WETLAND - Permanent soil inundation or saturation by surface water or groundwater resulting in a prevalence of vegetation adapted for life in saturated soil conditions.

PRACTICABLE - Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

PROJECT - Any Caltrans action that has potential effects on the environment.

RIPARIAN HABITAT - Woody vegetation (trees and shrubs) that grows in soils saturated for a substantial portion of the year, especially on the edges of open water (lakes, riverbanks, ditches). For purposes of this Agreement, two classes of riparian habitat are addressed:

1. Forested - The wetland class characterized by woody vegetation that is 6 m or taller.
2. Scrub-shrub - The wetland class characterized by woody vegetation that is less than 6 m tall.

SEASONAL WETLANDS - Soil inundation or saturation by surface water or groundwater occurring periodically during the growing season of the prevalent vegetation, sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Although vernal pools are typically considered a type of seasonal wetlands, vernal pools shall not be considered for mitigation at the Beach Lake Mitigation Bank. Seasonal wetlands dominated by species within the following generalist hydrophyte genera: Juncus, Eleocharis, Scirpus, Polygonum, Cyperus, Carex, and Typha would ordinarily be mitigable at the Beach Lake Mitigation Bank.

THREATENED SPECIES - Federal definition: A threatened species is any species designated as likely to become endangered in the foreseeable future throughout all or a significant portion of its range (16 USC 1532, 50 CFR 424.02). State definition: A threatened species is a native species or subspecies of bird, mammal, fish, amphibian, reptile, or plant that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by the California Endangered Species Act (Fish and Game Code Sec. 2067).

VERNAL POOLS - Vernal pools are seasonally flooded landscape depressions that support a distinctive flora and fauna adapted to periodic or continuous inundation during the wet season. Vernal pools typically are dominated by annual plant species (e.g. Downingia, Psilocarphus, Pogogyne), but may also include some perennials (e.g. Eryngium). Vernal pools shall not be considered for mitigation at the Beach Lake Mitigation Bank.

WETLANDS - Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

WETLAND HYDROLOGY - The area is inundated either permanently or periodically at mean water depths less than or equal to 6.6 feet, or the soil is saturated to the surface at some time during the growing season of the prevalent vegetation.

WETLAND MITIGATION BANK - A single contiguous parcel of land consisting of nonwetland habitat which has undergone those physical changes necessary to create and optimize the acreage and quality of wetland habitat on the site for the express purpose of providing mitigation credits to offset the adverse impacts to wetlands from approved projects elsewhere.

XII. EFFECTIVE DATE, TERMINATION OR MODIFICATION

This Agreement on Mitigation Strategy will become effective when approved by the Caltrans District 3 Director, Federal Highway Administration California Division Division Administrator, U.S. Environmental Protection Agency Region IX Water Management Division Director, U.S. Fish and Wildlife Service Sacramento Field Office State Supervisor, U.S. Army Corps of Engineers Chief Construction-Operations Division, and the California Department of Fish and Game Region 2 Manager.

This agreement may be modified with the written approval of all signatories to the Agreement on Mitigation Strategy. Modifications may be proposed by a single or inter-agency team of signatories. Proposed modifications will be submitted for a sixty-day period of review to all signatories.

A signatory may terminate its participation in this agreement upon written notice to all other signatories.

This agreement is intended to supplement, not replace, any existing agreements between any of the parties.

For the CALIFORNIA DEPARTMENT OF TRANSPORTATION

John L. Allison, District Director
Caltrans District 3

10-19-93
Date

For the FEDERAL HIGHWAY ADMINISTRATION

for Leonard E. Brown
Roger Borg, Division Administrator
California Division, Sacramento

12/17/93
Date

For the U.S. ENVIRONMENTAL PROTECTION AGENCY

for William H. Piers
Harry Seraydarian, Division Director
Water Management Division, Region IX

4/13/94
Date

For the U.S. FISH AND WILDLIFE SERVICE

Wayne S. White, State Supervisor
Sacramento Field Office

2/23/94
Date

For the U.S. ARMY CORPS OF ENGINEERS

D. A. Dennis, Chief
Construction-Operations Division

3/21/94
Date

For the CALIFORNIA DEPARTMENT OF FISH AND GAME

L. Ryan Broddrick, Regional Manager
Region 2

3/29/94
Date

APPENDIX 10.2
Vegetation Species Observed at the BLMB

Appendix 10.2 - Inventory of Plant Species in the Vicinity of the Beach Lake Mitigation Bank.

Community Types
1 = Coastal and Valley Freshwater Marsh
2 = Seasonal Marsh
3 = Great Valley Willow Scrub
4 = Great Valley Valley Oak Riparian Forest
5 = Great Valley Cottonwood Riparian Forest
6 = Ruderal

			Community Type					
Scientific Name	Common Name	Indicator*	1	2	3	4	5	6
Abutilon theophrasti	Velvet leaf	-		X			X	
Alisma plantago-aquatica (= A. triviale)	Water plantain	OBL					X	
Amaranthus retroflexus	Red-root pigweed	FACU		X				X
Ambrosia psilostachya	Naked-spike ragweed	FAC						X
Ammania coccinea	Purple ammania	OBL		X				
Anthemis cotula	Mayweed	FACU						X
Apocynum cannabinum	Clasping-leaf dogbane	FAC						X
Aristolochia californica	Pipe vine	-				X		
Artemisia douglasiana	Douglas' wormwood	FACW				X		X
Asparagus officinalis	Garden asparagus	FACU				X		X
Aster subulatus (= A. exilis)	Annual saltmarsh aster	FACW		X				
Atriplex patula	Halberd-leaf saltbush	FACW			X		X	
Avena fatua	Wild oat	-						X
Bidens cernua	Nodding beggar-ticks	OBL		X				
Bidens frondosa	Devil's beggar-ticks	FACW		X			X	
Boisduvalia densiflora	Dense-fl spike-primrose	OBL		X				
Brassica campestris	Field mustard	-						X
Brassica geniculata	Black mustard	-						X
Bromus diandrus	Ripgut brome	-				X		X
Bromus mollis	Soft brome	FACU						X
Bromus willdenovii	Rescue grass	-				X		
Capsella bursa-pastoris	Common shepherd's purse	FAC-						X

Appendix 10.2 - Continued.

Carex praegracilis	Clustered field sedge	FACW-				X		
Centaurea solstitialis	Star thistle	-						X
Cephalanthus occidentalis	Common buttonbush	OBL				X	X	
Chenopodium album	White goosefoot	FAC			X		X	
Cichorium intybus	Chicory	-						X
Cirsium arvense	Creeping thistle	FAC-						X
Convolvulus arvensis	Field bindweed	-						X
Conyza canadensis	Canada horseweed	FAC						X
Cornus glabrata	Brown dogwood	FACW				X		
Cressa truxillensis	Spreading alkali weed	FACW						X
Crypsis schoenoides *(= Heleochloa schoenoides)*	Swamp timothy	OBL		X				
Cuscuta indecora	Dodder	-	X	X	X			X
Cynodon dactylon	Bermuda grass	FAC						X
Cyperus difformis	Variable flatsedge	OBL		X				
Cyperus eragrostis	Tall flatsedge	FACW		X				
Cyperus erythrorhizos	Redroot flatsedge	OBL		X	X			
Cyperus esculentus	Chufa	FACW			X			X
Deschampsia danthonioides	Annual hairgrass	FACW						X
Distichlis spicata	Inland salt grass	FACW						X
Echinochloa crusgalli	Barnyard grass	FACW		X			X	
Eleocharis macrostachya	Creeping spike-rush	OBL		X				
Elymus triticoides	Creeping rye	FAC+				X	X	
Epilobium adenocaulon		-				X	X	
Epilobium brachycarpum *(= E. paniculatum)*		-		X				
Euthamia occidentalis *(= Solidago occidentalis)*	Western fragrant-goldenrod	OBL		X				X
Foeniculum vulgare	Sweet fennel	FACU				X	X	X
Galium aparine	Catchweed bedstraw	FACU					X	
Glycyrrhiza lepidota	American licorice	FAC+						X
Gnaphalium palustre	Western marsh cudweed	FACW		X				

Appendix 10.2 - Continued.

Helianthus annuus	Common sunflower	FAC-		X			X	X
Hemizonia pungens	Common tarweed	FAC						X
Hordium leporinum	Barley	-				X		
Juglans hindsii	Northern California walnut	FAC				X		X
Juglans regia	English walnut	-						X
Juncus patens	Spreading rush	FAC				X		
Lactuca serriola var. *integrata*	Prickly lettuce	FAC					X	X
Lactuca serriola	Prickly lettuce	FAC				X	X	X
Leersia oryzoides	Rice cutgrass	OBL					X	X
Lemna sp.	Duckweed	OBL					X	
Lepidium latifolium	Broad-leaf pepper-grass	FACW						X
Leptochloa fascicularis	Bearded sprangle top	OBL		X				
Lolium perenne	Perennial ryegrass	FAC						X
Lotus corniculatus	Bird's foot trefoil	FAC						X
Ludwigia peploides	Floating seedbox	OBL	X	X	X		X	
Lycopus americanus	American bugleweed	OBL	X					
Lythrum hyssopifolia	Hyssop loosestrife	FACW		X				
Malvella leprosa *(= Sida hederacea)*	Alkali mallow	FAC						X
Marrubium vulgare	Common horehound	FAC				X		X
Melilotus alba	White sweetclover	FACU+		X			X	X
Melilotus indica	Indian sweetclover	FAC		X				
Paspalum dilatatum	Dallisgrass	FAC						X
Phoradendron flavescens	Mistletoe	-					X	
Phylla nodiflora *(= Lippia nodiflora)*	Common frog-fruit	FACW						X
Picris echioides	Bristly oxtongue	FAC		X	X			X
Plantago lanceolata	English plantain	FAC-				X		X
Plantago major	Common plantain	FACW-				X		X
Platanus racemosa	California sycamore	FACW				X		
Polygonum aviculare	Prostrate knotweed	FAC						X

Appendix 10.2 - Continued.

Polygonum amphibium (= P. coccineum)	Water smartweed	OBL	X	X	X		X	X
Polygonum hydropiperoides	Swamp smartweed	OBL			X		X	
Polygonum lapathifolium	Willow-weed	OBL		X	X			
Polygonum persicaria	Lady's thumb	FACW	X	X	X		X	
Polygonum punctatum	Dotted smartweed	OBL					X	
Polypogon monspeliensis	Annual rabbit-foot grass	FACW+		X				
Populus fremontii	Fremont's cottonwood	FACW				X	X	
Portulaca oleracea	Common purslane	FAC						X
Prunus sp.		-				X		
Quercus lobata	Valley oak	FAC			X	X	X	X
Raphanus sativus	Wild radish	-						X
Rosa californica	California wild rose	FAC+				X		
Rubus procerus	Himalaya blackberry	FAC				X		X
Rubus vitifolius	California blackberry	FACW				X	X	X
Rumex crispus	Curly dock	FACW		X			X	X
Rumex fueginus	Sea-side dock	FACW		X				
Sagittaria sanfordii	Sanford's arrowhead	OBL	X				X	
Salix gooddingii var. *variabilis*	Goodding's willow	OBL			X	X	X	
Salix sessilifolia (= S. hindsiana)	Northwest willow	FACW			X			X
Salix lasiandra	Pacific willow	OBL			X			
Salix lasiolepis	Arroyo willow	FACW			X	X	X	
Sambucus mexicana	Mexican elderberry	FAC				X		
Scirpus acutus	Hard-stem bulrush	OBL	X		X		X	
Silybum marianum	Milk thistle	-						X
Solanum americanum (= S. nodiflorum)	Black nightshade	FAC		X	X		X	
Sonchus asper	Prickly sowthistle	-		X				X
Sonchus oleraceus	Common sowthistle	-		X				X
Sorghum halapense	Johnson grass	FACU						X
Sparganium eurycarpum	Giant burreed	OBL	X					

Appendix 10.2 - Continued.

Toxicodendron diversiloba	Poison oak	-				X	X	X
Tribulus terrestris	Puncture vine	-						X
Typha angustifolia	Narrow-leaf cattail	OBL	X	X				
Typha latifolia	Broad-leaf cattail	OBL	X	X				
Urtica dioica	Stinging nettle	FACW					X	X
Vitis californica	California wild grape	FACW				X	X	
Xanthium strumarium	Rough cockle-bur	FAC+		X	X		X	X

*** INDICATOR CATEGORIES (from Reed, 1988)**

(OBL) Obligate Wetland - Occur almost always (estimated probability >99%) under natural conditions in wetlands.

(FACW) Facultative Wetland - Usually occur in wetlands (estimated probability 67%-99%), but occasionally found in nonwetlands.

(FAC) Facultative - Equally likely to occur in wetlands or nonwetlands (estimated probability 34%-66%).

(FACU) Faculative Upland - Usually occur in nonwetlands (estimated probability 67%-99%), but occasionally found in wetlands (estimated probability 1%-33%).

(UPL) Obligate Upland - Occur in wetlands in another region, but occur almost always (estimated probability >99%) under natural conditions in nonwetlands in the region specified. If a species does not occur in wetlands in any region, it is not on the National List. [NOTE: For this appendix, species not found in Reed (1988) were idenfied with the following notation "-". This indicates that the species is either an UPL species or may be a wetland species that was not found in Reed (1988).]

A positive (+) or negative (-) sign is used with the facultative indicator categories (FACW,FAC,FACU) to more specifically define the regional frequency of occurrenc in wetlands. The positive sign indicates that the species is found more frequenty in wetlands and a negative sign indiactes that the species is found less frequently in wetlands.

APPENDIX 10.3
Mammal Species Observed at the BLMB

Appendix 10.3 - Inventory of Mammal Species Observed and/or Captured in the Vicinity of the BLMB.

Scientific Name (Common Name)	Community Types 1	2	3	4	5	6
DIDELPHIDAE *Didelphis virginiana* (Opossum)	X	X	X	X		
SORICIDAE *Sorex ornatus* (Ornate shrew)				X	X	
MOLOSSIDAE *Tadarida brasiliensis* (Mexican free-tailed bat)						X
LEPORIDAE *Lepus californicus* (Black-tailed jackrabbit) *Sylvilagus audubonii* (Desert cottontail)				 X	X X	X X
SCIURIDAE *Spermophilus beecheyi* (California ground squirrel)					X	X
GEOMYIDAE *Thomomys bottae* (Botta's pocket gopher)					X	X
CASTORIDAE *Castor canadensis* (Beaver)	X					
CRICETIDAE *Microtus californicus* (California meadow vole) *Ondatra zibethica* (Muskrat) *Peromyscus maniculatus* (Deer mouse) *Reithrodontomys megalotis* (Western harvest mouse)	X	X X X		 X X	X X X	
MURIDAE *Mus musculus* (House mouse) *Rattus rattus* (Black rat)		X	X X	X X	X	
CANIDAE *Canis latrans* (Coyote) *Urocyon cinereoargenteus* (Gray fox) *Vulpes vulpes* (Red fox)		X	X	X X	X X	X X X
PROCYONIDAE *Procyon lotor* (Raccoon)	X	X		X	X	X
MUSTELIDAE *Lutra canadensis* (River otter) *Mephitus mephitus* (Striped skunk) *Mustela vison* (Mink) *Spilogale gracilis* (Spotted skunk)	X X			 X X		 X X

Community Types
1 = Permanent Marsh (includes open water and shoreline)
2 = Seasonal Marsh
3 = Valley Oak Woodland
4 = Riparian Forest/Scrub
5 = Ruderal (includes fallow fields and grassland)
6 = Other Areas (e.g. residential, roadway, railroad tracks)

APPENDIX 10.4
Bird Species Observed at the BLMB

Appendix 10.4 - Inventory of Birds in the Vicinity of the Beach Lake Mitigation Bank, February through July 1991.

Community Types
PM = Permanent Marsh (includes open water and shoreline)
VM = Valley Oak Woodland
RF = Riparian Forest
R = Ruderal (includes plowed fields)
F = In Flight Over Property

Species List	PM	VW	RF	R	F
PODICIPEDIDAE					
Pied-billed Grebe	X				
PELECANIDAE					
White Pelican	X				X
PHALACROCORACIDAE					
Double-crested Cormorant	X				X
ARDEIDAE					
Great Blue Heron	X			X	
Great Egret	X			X	
Snowy Egret	X			X	
Black-crowned Night Heron	X				
ANATIDAE					
Tundra Swan					X
White-fronted Goose					X
Snow Goose					X
Canada Goose					X
Wood Duck			X		
Mallard	X				
Northern Pintail	X				
Cinnamon Teal	X				

ANATIDAE (Continued)						
Northern Shoveler	X					
Gadwall	X					
American Wigeon	X					
Ruddy Duck	X					
CATHARTIDAE						
Turkey Vulture						X
ACCIPITRIDAE						
Black-shouldered Kite				X	X	
Northern Harrier						X
Sharp-shinned Hawk				X		
Cooper's Hawk				X		
Red-shouldered Hawk				X		
Swainson's Hawk						X
Red-tailed Hawk						X
American Kestrel					X	
Prairie Falcon						X
PHASIANIDAE						
Ring-necked Pheasant					X	
California Quail				X	X	
RALLIDAE						
Common Moorhen	X					
American Coot	X					
GRUIDAE						
Sandhill Crane						X
CHARADRIIDAE						
Black-bellied Plover	X					
Killdeer	X				X	

RECURVIROSTRIDAE					
Black-necked Stilt	X				
American Avocet	X				
SCOLOPACIDAE					
Greater Yellowlegs	X				
Whimbrel					X
Dunlin	X				
Common Snipe	X				
LARIDAE					
Ring-billed Gull					X
Caspian Tern					X
Forster's Tern					X
COLUMBIDAE					
Rock Dove				X	
Mourning Dove		X		X	
STRIGIDAE					
Great Horned Owl		X			
Short-eared Owl				X	
ALCEDINIDAE					
Belted Kingfisher	X				
PICIDAE					
Nuttall's Woodpecker		X			
Downy Woodpecker			X		
Northern Flicker		X	X		
TYRANNIDAE					
Black Phoebe	X				
Ash-throated Flycatcher			X		
Western Kingbird				X	

HIRUNDINIDAE					
Tree Swallow		X	X		X
Cliff Swallow					X
Barn Swallow					X
CORVIDAE					
Scrub Jay		X	X		
Yellow-billed Magpie		X	X		
American Crow				X	X
PARIDAE					
Plain Titmouse		X	X		
AEGITHALIDAE					
Bushtit		X	X		
SITTIDAE					
White-breasted Nuthatch		X	X		
TROGLODYTIDAE					
Bewick's Wren		X	X		
House Wren			X		
Marsh Wren	X				
MUSCICAPIDAE					
Ruby-crowned Kinglet		X	X		
Western Bluebird			X	X	
American Robin		X	X		
MOTACILLIDAE					
Water Pipit				X	
BOMBYCILLIDAE					
Cedar Waxwing			X		X
STURNIDAE					
European Starling			X	X	

EMBERIZIDAE					
Orange-crowned Warbler		X	X		
Yellow-rumped Warbler		X	X	X	
Lazuli Bunting			X		
Rufous-sided Towhee			X		
Brown Towhee			X	X	
Fox Sparrow			X		
Song Sparrow			X	X	
Golden-crowned Sparrow		X	X		
White-crowned Sparrow		X	X		
Red-winged Blackbird	X				
Western Meadowlark				X	
Brewer's Blackbird			X	X	
Brown-headed Cowbird			X	X	
House Finch			X	X	
Lesser Goldfinch			X	X	
PASSERIDAE					
House Sparrow				X	

This chart only shows where these birds were observed on the BLMB property and does not mean that they do not utilize other habitats.